ROCHESTER PUBLIC WORKS DEPARTMENT STANDARD SPECIFICATIONS BOOK	**TRANSMITTAL LETTER NO.:** (04-01) **DATED:** April 1, 2004
SUBJECT: **S100, W200, C150, T100, ENGINEERING STANDARDS,** **Detail Plates, index, and entire sanitary & storm sewer section 1, 2-12a, 4-01, 03, 6-11a, 11b, 6-12a, 12b, 13, 14, 15, 17, 7-02a, 02b, 02c, 7-03a, 03b, 03c**	

The Standards for Street and Utility Construction have been updated.

As reported in the previous Transmittal Letter (02-02), updates will be made available on the internet for printing. The updates contained in Transmittal Letter No. 04-01 can be downloaded from the following web address.

http://www.ci.rochester.mn.us/publicworks/design/design_main.htm

INSTRUCTIONS:

1. Remove from the Standard Specifications Book

   Sewer Specification – Table of Contents, 1-2, 5-14
   Water Specification – 3-4, 11-12
   Service Connection – Table of Contents, 3-10
   Trench Excavation – 13-14
   Engineering Standards – Table of Contents, 13-14
   Detail Plates, – index, and entire sanitary & storm sewer section 1, 2-12a, 4-01, 03, 6-11a, 11b, 6-12a, 12b, 13, 14, 15, 17, 7-02a, 02b, 02c, 7-03a, 03b, 03c

2. Insert into the Standard Specifications Book

   Sewer Specification – Table of Contents, 1-2, 5-14
   Water Specification – 3-4, 11-12
   Service Connection – Table of Contents, 3-10
   Trench Excavation – 13-14
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   Detail Plates, – index, and entire sanitary & storm sewer section 1, 2-12a, 4-01, 03, 6-11a, 11b, 6-12a, 12b, 13, 14, 15, 17, 7-02a, 02b, 02c, 7-03a, 03b, 03c

3. Any questions or comments should be directed to Russ Kelm (507) 281-6193 or email me at the following address: mailto:rkelm@ci.rochester.mn.us

CHANGES MADE:

S100.102	*Added ASTM A1011, C877, Withdrawn ASTM F892*
S100.209	*Added section Waterproofing Manholes in Non-paved Areas*
S100.209-14	*Renumbered Sections*
S100.304	*Added Section S100.304 Access to Utilities*
S100.305-8	*Renumbered Sections*
S100.407	*Added "waterproofing, etc…)"*
W200.208	*Delete 2nd Sentence, "The American Flow Control high-density polyethylene trench adaptor will be considered an approved equal."*
W200.209	*Deletes U.S. Pipe & Foundry Metropolitan Snow Country 250 fire hydrant from the approved list.*
W200.304D	*Clarification in beginning of 3rd paragraph… "Direct Current (315 – 385 amps)".*
C150.203 6	*New sentence 6. Service saddles shall be a single band with a single draw point. The saddles shall be Fernco "E-Z Tap" or approved equal.*
C150.302	*Changed the word "backfill" to "backfilled" to last paragraph.*
C150.303A5	*New sentence #5 "A 4"x4" wooden post, extending one foot above grade, shall be placed by the pipe invert plug to mark the location of the pipe, when installed at a separate location from the water service".*
C150.304	*Changed the 2nd paragraph "…bottom of the bedding material" to … "… invert of the pipe…".*
C150.306C1(d)	*Change curb box location indicators from 2" x 4" stakes to 4" x 4" wooden posts.*
T100.402B	*Changed wording of first sentence of paragraphs 2&3 to read "the lowering of the existing ground profile is required as part of the same projects"& "In those areas where no lowering of the existing ground profile is required as part of the same project".*
ES 1005.10	*New section on future sewer laterals, stubs.*

Detail Plates

1-01	*Changed SDP Reference numbers in notes 1, 2 & 8.*
1-02	*Changed note 2 to include bolt down for field application.* *Changed SDP Reference numbers in notes 2 & 3.*
1-03	*Changed note 2 to include bolt down for field application.* *Changed SDP Reference numbers in notes 2 & 3.*
1-04	*Changed note 3 to include bolt down for field application.* *Changed SDP Reference numbers in notes 3 & 4.*
1-05	*New Plate*

1-06	*New Plate*
1-07	*Renumbered from 1-09.*
1-08	*Renumbered from 1-06.*
1-09	*Changed Grate type 5.*
	Added Grate types 7 & 8.
	Renumbered from 1-05.
1-10	*Renumbered from 1-07.*
1-11	*Renumbered from 1-08.*
2-12a	*Changed minimum ramp width from 3' to 4' at curb line.*
4-01	*Changed note 4 to include 4"x4" wood post.*
	Changed SDP Reference number in note 8.
4-03	*Put Gas line in same trench as Electric, Telephone and TV conduits.*
	Deleted Gas trench cross-section.
	Changed all piping to SDR 35.
	Changed RPU warning tape color from yellow to red.
	Changed dimensions on conduit cross-section.
	Added note 6.
6-11a	*Changed titles for Details.*
	Changed note 4 in Residential Detail to Full Flow Stop Valve.
	Changed note 7 in Residential Detail to Full Flow Stop Valve.
	Changed note 4 in Manufactured Home Detail to Full Flow Stop Valve.
	Changed note 7 in Manufactured Home Detail to Full Flow Stop Valve.
6-11b	*Changed title for Commercial Details.*
	Changed note 8 by dropping word devices.
6-12a	*Changed title for Outdoor Metering Detail.*
	Removed RPZ from note for Outdoor Metering.
	Changed Outdoor metering note 7 to Approved Backflow Preventer.
	Removed sprinkler head and label from Indoor Metering Detail.
	Changed note 4 in Indoor Metering Detail to Full Flow Stop Valve.
	Changed note 8 in Indoor Metering Detail to Full Flow Stop Valve.
	Changed note 9 in Indoor Metering Detail to Approved Backflow Preventer.
6-12b	*Changed title for Metering Detail.*
	Changed note 7.
6-13	*Changed title for service layout.*
6-14	*Changed title from Mobile Home to Manufactured Home.*
6-15	*Changed title of plate.*
6-17	*Added notes 1 & 2.*
7-02a	*Redrew BALE DITCH CHECK, changed name.*
	Added usage note to title.
	Removed "Recommended Spacing" chart and added a spacing formula.
	Changed point "A" to be 1'0" min. above point "B", added dimension.
	Removed "Design Guidelines" chart and added a Mn/DOT reference.
7-02b	*Changed point "A" to be 1'0" min. above point "B", added dimension.*
	Changed "Geotextile Filter" to "Geotextile Fabric Liner Type IV".
	Removed "Geotextile Fabric Filter" from Riprap note.
	Removed "Recommended Spacing" chart and added a spacing formula.
	Removed "Design Guidelines" chart and added a Mn/DOT reference.
	Added Final Acceptance note.

7-02c	*Changed point "A" to be 1'0" min. above point "B", added dimension.* *Removed "Recommended Spacing" chart and added a spacing formula.* *Removed "Design Guidelines" chart and added a Mn/DOT reference.* *Changed notes 1 and 2 and added note 3.* *Added Embedment dimension.*
7-03a	*Changed note 1 from "mono/mono" to "monofilament in both directions".* *Changed note 2 from "spec. 3891 Type-A" to "3891 Type-C".*
7-03b	*Changed note 1 from "mono/mono" to "monofilament in both directions".*
7-03c	*Changed "Washed Aggregate" to "Type 9 Mulch".* *Changed 12" min. depth of aggregate to 6" min.*

SEWER SPECIFICATIONS
S100

Rochester, MN

TABLE OF CONTENTS

Section 1 GENERAL REQUIREMENTS

S100.101 Description

This work shall consist of the construction of pipe sewers utilizing plant-fabricated pipe and other appurtenant materials, installed for conveyance of sewage or storm water. The work includes construction of manhole and catch basin structures and other related items as specified.

The City of Rochester reserves the right, at any time during the construction of any sewer embraced within the limits of this contract, to issue a permit to a property owner to connect premises to the sewer. In the event such a permit is issued, the Contractor is not relieved of the responsibility to complete their contract according to Plans and Specifications. The issuance of a permit by the City to tap or connect to any part of a sewer embraced within the limits of this contract shall in no sense be construed as acceptance of any part of the work.

Use of the term "Plans, Specifications, and Special Provisions" within this specification shall be construed to mean those documents which compliment, modify, or clarify these specifications and are accepted as an enforceable component of the Contract or Contract Documents.

S100.102 Reference Documentation

Provisions of the General Conditions and Trench Excavation & Backfill/Surface Restoration shall apply to this work. The Contractor shall abide by the applicable provisions of state, federal and local laws and ordinances.

All references to Mn/DOT Specifications shall mean the latest published edition of the Minnesota Department of Transportation Standard Specifications for Construction as modified by any Mn/DOT Supplemental Specifications issued before the date of advertisement for bids. All references to other Specifications of AASHTO, ASTM, ANSI, AWWA, etc. shall mean the latest published edition available on the date of advertisement for bids.

The following specifications have been referenced in this Specification:

ASTM A48	Specification for Gray Iron Castings
ASTM A1011	Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formabilitygs
ASTM C76	Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C270	Specification for Mortar for Unit Masonry
ASTM C361	Specification for Reinforced Concrete Low-Head Pressure Pipe
ASTM C443	Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C478	Specification for Precast Reinforced Concrete Manhole Sections
ASTM C877	Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections
ASTM D543	Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
ASTM D2241	Standard Practice for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D3350	Specification for Polyethylene Plastics Pipe and Fittings Materials
ASTM D3034	Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3262	Specification for "Fiberglass" (Glass Reinforced Thermosetting-Resin) Sewer Pipe
ASTM D4161	Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals
ASTM F477	Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F667	Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings

ASTM F679	Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
ASTM F794	Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
ASTM F949	Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
ASTM F1803	Specification for Poly (Vinyl Chloride)(PVC) Closed Profile Gravity Pipe and Fittings Based on Controlled Inside Diameter
ANSI A21.4	Standard for Cement - Mortar Lining for Ductile Iron Pipe and Fittings
ANSI A21.11	Standard for Rubber - Gasket Joints for Ductile Iron Pressure Pipe and Fittings
ANSI A21.51	Standard for Ductile Iron Pipe Centrifugally Cast
ANSI A21.53	Standard for Ductile-Iron Compact Fittings, 3 in. through 24 in

Provisions. Unless otherwise specified, all pipe and fittings shall be push-on with snug fit elastomeric joints meeting tightness requirements of ASTM 3212.

Polyvinyl Chloride (PVC) pipe shall be installed in conformance with the requirements of ASTM D-2321. Only class B embedment materials shall be used for PVC applications.

S100.207 Dual Wall Corrugated Polyethylene Pipe

Dual-Wall Corrugated Polyethylene Pipe shall conform to the requirements AASHTO M294 and Design 18 of the AASHTO Standard Specifications for Highway Bridges. The allowable storm sewer pipe sizes are 12-inch through 36-inch and must be located outside the roadway section. Joints shall be watertight unless the engineer approves a soil-tight joint. Pipe manufacture, watertight joint testing, and installation shall conform to current Mn/DOT requirements and/or as indicated in the Plans, Specifications, and Special Provisions.

S100.208 Fiberglass Reinforced Polymer Mortar Pipe

Fiberglass Reinforced Polymer Mortar Pipe shall conform to the requirements ASTM D-3262, ASTM D4161, and AWWA M45 for the size and strength requirements indicated on the Plans, Specifications, and Special Provisions.

S100.209 Waterproofing Manholes in Non-paved Areas

Waterproofing manholes in non paved areas shall conform to the requirements of ASTM C877, and the City of Rochester Detail Plate, for the size and type indicated on the Plans, Specifications, and Special Provisions. In addition, the Manhole waterproofing shall comply with the following supplementary provisions:

1. External Chimney seal shall consist of a 3/16" thick flexible rubber sleeve conforming to ASTM C-923 with interlocking extensions and 16 gauge stainless steel compression bands.
2. Embankment shall be placed around the chimney seal for protection, unless otherwise specified.
3. A manhole marker sign shall be included as shown on the detail.

S100.210 Metal Sewer Castings

Metal castings for sewer structures such as manhole frames and covers, catch basin frame grates and curb boxes, shall conform to the requirements of ASTM A48 (Gray Iron Casting) subject to the following supplementary provisions:

1. Casting assemblies or dimensions, details, weights, and class shall be as indicated in detailed drawings for the design designation specified. Unless otherwise specified, the castings shall be Class 30 or better.
2. Lid-to-frame surfaces on round casting assemblies shall be machine milled to provide bearing around the entire circumference.
3. Casting weight shall be not less than 95 percent of theoretical weight for a unit cast to exact dimensions, based on 442 pounds per cubic foot.
4. A Certificate of Compliance shall be furnished with each shipment of castings stating the materials furnished have been tested and are in compliance with the specification requirements.
5. Unless otherwise specified, sanitary sewer manholes in areas subject to flooding by surface water shall have self-sealing, bolt-down, lids and recessed pick holes.

S100.211 Precast Concrete Manhole and Catch Basin Sections

Precast concrete riser sections and appurtenant units (grade rings, top and base slabs, special sections, etc.) used in the construction of manhole and catch basin structures shall conform with the requirements of ASTM C-478, Mn/DOT 2506 and the following supplementary provisions:

1. The precast sections and appurtenant units shall conform to all requirements as shown on the detailed drawings.
2. Joints of manhole riser sections shall be tongue and groove with rubber "O" ring joints provided on sanitary sewer manholes. Sanitary sewer inlet and outlet pipes shall be joined to the manhole with a gasketed, flexible, watertight connection or any watertight connection arrangement that allows differential settlement of the pipe and manhole wall to take place.
3. Air-entrained concrete shall be used in the production of all units. Air content shall be maintained within the range of 5 to 7 percent.
4. A Certificate of Compliance shall be furnished with each shipment of precast manhole and catch basin sections stating that the materials furnished have been tested and are in compliance with the specification requirements.
5. Lift holes will not be permitted in manhole sections smaller than 60" in diameter. On manholes 60" and larger diameter, the lift holes shall be filled with a commercially manufactured lift hole plug and non-shrink concrete grout. The concrete grout shall have an approved bonding agent added.

S100.212 Concrete

Concrete for cast-in-place masonry construction shall be produced and furnished accordance with the requirements of Mn/DOT Specification 2461 for the mix designation indicated in the Plans. The requirements for Grade B concrete shall be met where a higher grade is not specified. Type 3 (air-entrained) concrete shall be furnished and used in all structures.

S100.213 Mortar

Mortar for use in masonry construction shall be an air-entrained mixture of one part Masonry cement, Type S, and 2.5 parts mortar sand, with sufficient water to produce proper consistency, and with sufficient air-entraining agent added to maintain an air content within the range of 7 to 10 percent. Mortar shall meet the requirements of ASTM C-270.

S100.214 Trash Guard

Trash guards, where shown on the plan shall have 5/8" (16mm) vertical galvanized steel rods placed 6" (150mm) center to center unless otherwise specified. The guard shall be securely attached to the end section.

S100.215 Riprap

Riprap, where shown on the plans, shall be constructed in accordance with Mn/DOT Section 2511.

Section 3 CONSTRUCTION REQUIREMENTS

S100.301 Notification by Contractor

A. Sanitary Sewer Construction

The discharge of surface water runoff or ground water into the city's sanitary sewer system is prohibited. To protect the sanitary sewers, authorized users, and the treatment works from the accidental discharge of surface water runoff or ground water into the active sanitary sewer the following procedure shall be followed:

1. Two weeks before connecting any new sewer piping to the existing sewer system, the contractor shall notify the Rochester Sewer Division of the Department of Public Works as to the schedule of sewer construction activities.
2. The Rochester Sewer Division will install a sewer plug in the outlet of the most downstream manhole through which no sewage is presently passing and that the new sewer will be connected. A plug will be install into each connection to the city's sewer system. In the event that the manhole into which the plug must be installed is a manhole constructed with this project, the Contractor shall notify the Rochester Sewer Division within 24 hours of the installation.
3. After the Rochester Sewer Division has installed the plug, the Contractor may proceed with the Installation of the sewer extension. Upon completion of the work including the cleaning of the sewer lines, air testing the sewer, and conducting the mandrel test, the Contractor shall notify the Rochester Sewer Division. Rochester Sewer Division will televise the public sewer mains. Once all the sewer extension passes all specified tests, the Rochester Sewer Division will remove the sewer plugs.
4. The sewer plugs will be installed by the Rochester Sewer Division and shall be removed by the Sewer Division. The Contractor shall not disturb the plugs.

S100.302 Installation of Pipe and Fittings

A. Inspection and Handling

Proper and adequate implements, tools, and facilities satisfactory to the Engineer shall provided and used by the Contractor for the safe and convenient prosecution of the work. During the process of unloading, all pipe and accessories shall be inspected by the Contractor for damage. The Contractor shall notify the Engineer of all material found to have cracks, flaws or other defects. The Engineer shall inspect the damaged materials and have the right to reject any materials found to be unsatisfactory. The Contractor shall promptly remove all rejected material from the site. All materials shall be handled carefully, as will prevent damage to protective coatings, linings, and joint fillings; preclude contamination of interior areas; and avoid jolting contact, dropping, or dumping

All work and materials are subject to tests by the City at such frequency as may be determined by the Engineer.

While suspended and before being lowered into laying position, each pipe section and appurtenant unit shall be inspected by the Contractor to detect damage or unsound conditions that may need corrective action or be cause for rejection. The Contractor shall inform the Engineer of any defects discovered and the Engineer will prescribe the required corrective actions or order rejection.

Immediately before placement, the joint surfaces of each pipe section and fitting shall be inspected for the presence of foreign matter, coating blisters, rough edges or projections, and any imperfections so detected shall be corrected by cleaning, trimming, or repair as needed.

B. Pipe Laying Operations

Trench excavation and bedding preparations shall proceed ahead of pipe placement as will permit proper laying and joining of the units at the prescribed grade and alignment without unnecessary deviation or hindrance.

All foreign matter or dirt shall be removed from the inside of the pipe and fittings before they are lowered into position in the trench and they shall be kept clean by approved means during and after laying. The sewer materials shall be carefully lowered into laying position by the use of suitable restraining devices. Under no circumstances shall the pipe be dropped into the trench.

At the time of pipe placement, the bedding conditions shall be such as to provide uniform and continuous support for the pipe between bell holes. Bell holes shall be excavated as necessary to make the joint connections, but they shall be no larger than would be adequate to support the pipe throughout its length. No pipe material shall be laid in water or when the trench or bedding conditions are otherwise unsuitable or improper.

When placement or handling precautions in the Engineer's opinion prove inadequate, the Contractor shall provide and install suitable plugs or caps effectively closing the open ends of each pipe section before it is lowered into laying position, and they shall remain so covered until removal is necessary for the connection of an adjoining unit.

Unless otherwise permitted by the Engineer, bell and spigot pipe shall be laid with the bell ends facing upgrade and the laying shall start on the downgrade end and proceed upgrade. As each length of bell and spigot pipe is placed in laying position, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved backfill material, which shall be thoroughly compacted by tamping around the pipe to a height of at least 12 inches above the top with hand operated mechanical tamping devices or by hand. The joint areas shall remain exposed and precautions shall be taken to prevent the soil from entering the joint space, until the joint seal is effected. Backfill in the bell area shall be left loose

Connection of pipe to existing lines or previously constructed manholes or catch basins shall be accomplished as shown in the Plans or as otherwise approved by the City. Where necessary to make satisfactory closure or produce the required curvature, grade or alignment deflections at joints shall not exceed that which will assure tight joints and comply with any limitation recommended by the pipe manufacturer.

Entrance of foreign matter into pipeline openings shall be prevented at all times to the extent that suitable plugs or covering can be kept in place over the openings without interfering with the installation operations.

C. Connection and Assembly of Joints

All pipe and fitting joints shall fit tightly and be fully closed. Spigot ends shall be marked as necessary to indicate the point of complete closure. All joints shall be soil tight, as the minimum requirement, and shall be watertight in all sanitary sewer lines. Where specified, the joints in certain assemblies shall be made structurally integral by being completely encased in concrete to form a rigid watertight unit as indicated in the standard drawings.

All joints shall be sealed as follows, subject to such other approved method as the City may authorize as being acceptable alternative:

1. Concrete pipe and fitting joints – compression type rubber gasket seals conforming to the requirements of ASTM C443, ASTM C-361 or AASHTO M-198 for circular pipe, or as otherwise approved by the Engineer in the case of non-circular pipe sections.
2. PVC pipe and fittings – assembled gasket seal joints.

3. Corrugated smooth wall PVC and corrugated double wall HDPE pipe and fittings – assembled push-on gasketed joints shall pass performance tests as listed in ASTM D-3212.
4. Corrugated steel pipe and fittings – sealed with Mn/DOT Standard Detail Plate M3221C.
5. Connections to storm sewer mains at other locations than manholes and catch basins shall be made with precast tees, wyes or junction boxes. Field cut openings may be permitted for mains, which are at least 2 times the size of the branch and no further than 100-ft from a structure. The materials, work and method of connection for other than precast connections shall be subject to the City's approval.

D. Bulk heading Open Pipe Ends

All pipe and fitting ends left open for future connection shall be bulk headed by approved methods prior to backfilling. Unless otherwise specified or approved, all openings of 24 inches diameter or less shall be closed off with prefabricated plugs or caps and all storm sewer openings larger than 24 inches in diameter shall be closed off with masonry bulkheads.

Prefabricated plugs and caps shall be of the same material as the pipe material, or an approved alternate material, and they shall be installed with watertight seal as required for the pipeline joints. Masonry bulkheads shall be constructed with concrete brick, or solid block to a wall thickness of 8 inches.

S100.303 Appurtenance Installations

Appurtenance items such as aprons, trash guards, gates and castings shall be installed where and as required by the Plans and in accordance with such standard detail drawings or supplementary requirements as may be specified.

Casting assemblies to be raised or lowered shall follow Mn/DOT Specification 2506.3 with the following modification: the structure construction (excluding casting) above the cone shall not exceed 1 foot.

When the plans call for reconstruction of structures, all debris shall be removed from the bottom of the old structure without additional compensation.

Sewer aprons shall be subject to all applicable requirements for installation of pipe. All aprons and outfall end sections shall be tied as per Mn/DOT Standard Plate 3145.

S100.304 Access to Utilities

At the time any utility is tested, the Contractor shall provide the City access to the manhole or gate valve. At no time shall the tested utility be inaccessible, either under the pavement or ground.

For utilities located in the pavement surface, the access shall be set flush to the current, pavement surface. At the time of installation of the final pavement surface, the casting or valve, shall be reset or adjusted flush to the final pavement surface. This second adjustment shall be incidental to the construction. At no time shall the casting or valve be set to an elevation higher than the current, pavement surface with the pavement ramped or "blistered" around the structure.

For utilities <u>not</u> located in the pavement surface, the castings shall be set flush to the final finish grade.

S100.305 Sewer Service Installations

Main sewer service connections and building service sewer pipe shall be installed as provided for in the Contract and as may be directed by the City. The sewer service connections and pipe lines shall be installed in conformance with all applicable requirements of the main sewer installation and as more specifically provided in the City of Rochester standard specification for the construction of service connections.

S100.306 Sanitary Sewer Leakage Testing

All sanitary sewer lines, including service connections, shall be substantially watertight and shall be tested for excessive leakage upon completion and before connections are made to the service by Others.

For gravity flow sewers, the sewer shall be subjected to exfiltration testing, by the ASTM F1417 (low pressure air) test method regardless of pipe material.

For sewers designated as pressure pipe sewers, the sewer shall be subjected to exfiltration testing, by the Minnesota Plumbing Code 4715.2820.

The requirements set forth for maximum leakage shall be met as a condition for acceptance of the sewer section represented by the test. All testing shall be performed by the Contractor without any direct compensation being made therefore, and the Contractor shall furnish all necessary equipment and materials, including plugs as required.

A. Air Test Method-Gravity Sewer

The Table below contains selected text from ASTM F1417 (Gravity Sewer Lines).

4.1 The section of the line to be tested is plugged. Air, at low pressure, is introduced into the plugged line. The line passes the test if the rate of air loss, as measured by pressure drop, does not exceed a specified amount in a specified time. Pressure drop may be determined by using Table 1 or Table 2, or calculated by use of the formulas in 9.2.

TABLE 2 1 Minimum Specified Time Required for a 0.5 psig Pressure Drop for Size and Length of Pipe Indicated for Q = 0.0015

NOTE-Consult with pipe and appurtenance manufacturer for maximum test pressure for pipe size greater than 30 in. in diameter.

Pipe Diameter, in.	Minimum Time, min : s	Length for Minimum Time, ft	Time for Longer Length, s	Specification Time for Length (L) Shown, min:s							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	1:53	597	0.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	0.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3.12
8	3:47	298	0.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5.04	5.42
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7.54	8.54
12	5:40	199	1.709 L	5:40	5:40	5:42	7:08	8:33	9:58	11.24	12.50
15	7:05	159	2.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17.48	20.02
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	25.38	28.51
21	9:55	114	5.235 L	9:55	13:05	17:27	21:49	28:11	30:32	34.54	39.16
24	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45.35	51.17
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:18	50:30	57.42	64.54
30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71.13	80.07
33	15:35	72	12.926 L	21:33	32:19	43:56	53:52	64:38	75:24	86.10	96.57
36	17:00	66	15.384 L	25:39	38:28	51:17	64:06	76:55	89:44	102.34	115.23

9.2 Calculate all test times by the following formula:

$$T = 0.085\ DK/Q$$

where:

T = shortest time allowed for the air pressure to drop 1.0 psig, s,
K = 0.000419 DL but not less than 1.0,
Q = leak rate in cubic feet/minute/square feet of internal surface = 0.0015 CFM/SF,
D = measured average inside diameter of sewer pipe (see Method D 2122 and Practice D 3567), in., and
L = length of test section, ft.

Table 1 contains the specified minimum times required for a 1.00 psig pressure drop from a starting pressure of 3.5 psig to a final pressure of 2.5 psig using a leakage rate of 0.0015 ft3/min/ft2 of internal surface.

B. Air Test Method-Pressure Pipe

The air test shall be made by attaching the air compressor or testing apparatus to any suitable opening and closing all other inlets and outlets to the system by means of proper testing plugs. Air shall be forced into

the system until there is a uniform pressure of five (5) psi on the portion of the system being tested. The pressure shall remain constant for 15 minutes without the addition of air.

C. Test Failure and Remedy

In the event of test failure on any test section, testing shall be continued until all leakage has been detected and corrected to meet the requirements. All repair work shall be subject to approval of the Engineer. Introduction of sealant substances by means of the test water will not be permitted.

Unsatisfactory repairs or test results may result in an order to remove and replace pipe as the Engineer considers necessary for test conformance. All repair and replacement work shall be at the Contractor's expense.

S100.307 Deflection Test

Deflection tests shall be performed on all plastic gravity sewer pipes. The test shall be conducted after the sewer trench has been backfilled to the desired finished grade for a minimum of 30 days.

The deflection test shall be performed by pulling a rigid ball or pointed mandrel through the pipe without the aid of mechanical pulling devices. The ball or mandrel shall have a minimum diameter equal to 92.5 % of the actual inside diameter of the pipe. The maximum allowable deflection shall not exceed 5 % of the pipe's internal diameter. The line will be considered acceptable if the mandrel can progress through the line without binding. The time of the test, method of testing, and the equipment to be used for the test shall be subject to the approval of the City.

All testing shall be performed by the Contractor at its expense without any direct compensation being made therefore, and he shall furnish all necessary equipment and materials required.

A. Test Failure and Remedy

In the event of test failure on any test section, the section shall be replaced, with all repair work subject to approval of the City. The replaced section shall be re-tested for leakage and deflection in conformance with the specifications contained herein. All repairs, replacement, and re-testing shall be at the Contractor's expense.

S100.308 Televising

The city will televise all lines regardless of visual inspection, leakage testing, or deflection testing.

Section 4 METHOD OF MEASUREMENT

S100.401 Description

All items will be measured separately according to design designation as indicated in the Pay Item name and as may be detailed and defined in the Plans, Specifications, or Special Provisions. Pipe will generally be designated by size (inside diameter or span); strength class, kind or type, and laying condition. Complete-in-place items shall include all component parts thereof as described or required to complete the unit, but excluding any excesses covered by separate Pay Items. Linear measurement of piping will include the running length of any special fittings (tees, wyes, elbows, gates, etc.) installed within the line of measure between specified terminal points.

S100.402 Sewer Pipe

Sewer pipe of each design designation will be measured by length along the line of pipe. Terminal points of measurement will be the pipe end at free outlets; the point of connection with inplace pipe; the center of manholes or catch basins; the point of centerline intersections at branch fittings; or the point of juncture with other appurtenances or units as defined.

Measurements for trench excavation will be determined separately, when included in the Pay Items for the Plans, and according to the Trench Excavation Specification.

S100.403 Manholes and Catch Basins

Manholes and catch basins of each design will be measured by number of each constructed complete-in-place, including the base and castings as required, for the depth increments as stated in the proposal.

The depth of manholes and catch basins shall be considered as being the distance from the top of the ring, cover, or grate to the invert elevation at the center of the structure.

S100.404 Reconstruct Manholes and Catch Basins

Reconstructed manholes and catch basins will be measured by height from the bottom of the reconstructed portion to the bottom of the ring or frame casting with no regard to type.

Connection of new catch basins to the existing storm sewer piping, including up to 1.5m (5 feet) of new pipe per location, and interconnection of multiple catch basins shall be considered an incidental expense.

S100.405 Adjust Frame and Ring Casting

Adjust frame and ring casting will be measured by the number of castings adjusted, all the castings in any one structure being considered as one assembly.

S100.406 Outside Drop Connection

Outside drop connections of each design will be measured by number of each constructed complete-in-place, including granular encasement, fittings, and any special piping as required, including two holes into existing manhole for the drop connection.

S100.407 Special Pipe Fittings

Special pipe fittings (wyes, tees, bends, waterproofing, etc.) of each design designation will be measured by number of each installed complete-in-place as specified, but excluding any such fittings required to be installed as a component part of any other Work Unit.

S100.408 Appurtenant Items

Appurtenant items such as aprons, trash guards, gates and other prefabricated units or assemblies as identified by Pay Item name will be measured separately by number of each installed complete-in-place as specified.

WATERMAIN SPECIFICATIONS
W200

Rochester, MN

W200.205 Isolation Valves

Unless otherwise specified in the Plans or Special Provisions, isolation valves shall be resilient seated gate valve type, with non-rising stem, ductile iron body and fusion-bonded epoxy coating on interior and exterior surfaces.

Resilient seated gate valves shall have mechanical joint ends or single gasket joint type ends and be designed to operate under 200 pounds working pressure and shall conform to the requirements of AWWA C-509. Valves are to open counter-clockwise. Valves are to be furnished with stainless steel bonnet bolts and nuts and shall not have test plugs.

W200.206 Tapping Sleeves and Valves

The tapping valve shall meet the same requirements as the previously described resilient seated gate valves except the inlet flange shall meet ANSI B-16.1 for Cast Iron Pipe Flanges, Class 125. The tapping sleeve shall have mechanical joint ends and ANSI Class 125 flange complying with AWWA C500.

W200.207 Cutting in Sleeves

Cutting-in sleeves are not permitted. Only mechanical joint solid sleeves with retainer glands shall be used for pipe cut-ins (one per cut-in). Stainless steel repair sleeves shall not be used for this application.

W200.208 Valve Boxes

Valve boxes shall be the screw type, have a minimum inside shaft diameter of 5 1/4", and have a cap with the word "WATER" plainly marked on top. In all respects the valve box shall be equal to Tyler 6860 Series.

The valve box assembly shall be furnished in such lengths of sections needed to satisfactorily complete the installation to the desired height without field cutting either the center or top section of the box.

W200.209 Hydrants

All hydrants shall be of a standard make and shall be designed to safely hold a working pressure of 150 lbs per square-inch, and not cause "water hammer" with extraordinary usage. Hydrants shall be of the Non-Jacket Type and shall further be of such design that if the hydrant is broken off, the valve will remain closed.

Hydrants shall be Waterous (Pacer WB-67) meeting the following specifications:

1. Ductile iron body
2. All bronze drain
3. 5-1/4" valve opening
4. 6" mechanical joint connection
5. Two 2-1/2" National Standard Thread hose connections
6. One 4" Rochester Standard Steamer Thread hose connection
7. 1-1/2" National Standard operating nut (Pentagon), counter-clockwise turn to open
8. Twist-in mechanically attached nozzles
9. Traffic break-off, 24" minimum distance from ground to centerline of nozzle
10. Minimum working pressure - 150 psi
11. Hydrostatic test pressure - 300 psi
12. Bronze seat ring insert
13. International Orange Epoxy Coating, 6.0 mil minimum total coating dry film thickness
14. Compliance with AWWA C502

Unless otherwise specifically directed by the Engineer, the hydrant assembly shall be furnished in the length needed to satisfactorily complete the installation to the desired height without the use of "Bonds" or "Offsets." In cases deemed necessary and authorized by the Engineer, "Hydrant Extensions" may be used. No additional compensation will be allowed for furnishing and installing such fittings.

W200.210 Materials for Restraining Joints

A. Tie Rods (use only for restrained joints connecting to existing watermain)

Tie rods and clamping devices used for rodding at fittings shall be of the required size and adequate strength to secure the installation from movement. The rod size and clamping arrangement shall be as indicated on the Plans or Detail Plates for Watermain Tie Rods and Clamping Devices.

Tie rods shall be galvanized, and other clamping devices shall be epoxy-coated.

All such materials shall be approved by the Engineer before being used in the work.

B. Retainer Glands (use for restrained mechanical joints)

Mechanical joint retainer glands shall be Mega lug Retainer Glands as manufactured by EBAA Iron, Inc. or approved equal.

C. Single Gasket Restrained Joints

Single gasket restrained joints shall be American Fastite type with Fast-Grip gaskets, US Pipe Tyton Field Lok or approved equal. Electrical conductivity is to be maintained across all single gasket pipe joints.

W200.211 Miscellaneous Materials

Any other miscellaneous material required in the work not specifically mentioned in these specifications, shall be new, unused, undamaged, and of a quality equal to the materials specified herein and shall be submitted to, and approved by, the Engineer prior to its use.

P = Average pressure (in psig) during the leakage test (not necessarily the test pressure). This pressure shall be determined by subtracting the average elevation of all tested pipe joints from the elevation of the pressure plane represented by the specified or authorized leakage test pressure, and then converting this difference, in feet or head, to pounds per square-inch hydrostatic pressure. The average pressure may be assumed to be equal to the test pressure where the maximum difference in elevations of the pipe joints being tested does not exceed 20 feet.

In the event that the line or section being tested contains pipe of more than one size, the allowable leakage from all joints of each size shall be calculated separately and then added to obtain the total allowable leakage from the entire line or lines.
The table below summarizes the maximum allowable main leakage (taken from Table 6A, AWWA C600):

Allowable Leakage per 1000 ft of Pipeline, gal/hr*							
Avg Test	**Nominal Pipe Diameter, In.**						
Pressure, (psi)	4	6	8	12	16	20	24
100	0.30	0.45	0.60	0.90	1.20	1.50	1.80
125	0.34	0.5	0.67	1.01	1.34	1.68	2.01
150	0.37	0.55	0.74	1.10	1.47	1.84	2.21
175	0.40	0.59	0.80	1.19	1.59	1.98	2.38
200	0.43	0.64	0.85	1.28	1.70	2.12	2.55
Normal test pressure is 150 psi.	*Allowable leakage for typical watermain installation.						

Based on 11.65 gpd/mi/in. nominal diameter at a pressure of 150 psi. (AWWA C600)

Where a second pressure test is made following line repairs, the leakage during such test may be measured as a part of the leakage test, provided that where the remainder of the leakage test is made at a reduced pressure as provided herein, the leakage during the application of each of the two pressures shall be measured separately.

It is the intent of this Specification and the Contract based thereon that (a) all joints in piping shall be watertight and free from visible leaks during the prescribed leakage test, and (b) each and every leak that is discovered at any time prior to the expiration of two (2) years from and after the date of final acceptance of the work by the City shall be located and repaired by and at the expense of the Contractor, regardless of any amount that the total line leakage rate during the specified leakage test may be below the specified maximum rate.

If the specified leakage test is made after the pipe line has been backfilled and the joints covered, and such test shows a leakage rate in excess of the permissible maximum, the Contractor shall make all necessary surveys in connection with the location and repair of leaking joints to the extent required to reduce the total leakage to an acceptable amount. Where evidence of leaking joints does not appear on the ground surface above or near the leaks, the Contractor shall prospect the line by sinking a hole, with an auger or otherwise, at the location of each joint and determine any undue saturation of the soil that would indicate a leak at such joint. This prospecting shall be done after pressure has been maintained in the line for a sufficient time to provide adequate soil saturation for locating leaks by this method.

Leaks in mechanical joints shall be repaired by dismantling, cleaning, realigning gland and gasket and rebolting. Under no circumstances shall gland bolts be tightened beyond the specified and allowable torque limits in an attempt to reduce or stop leakage from a defective joint or for any other purpose.

D. Electrical Conductivity Testing

The Contractor shall perform conductivity testing on newly installed watermain in the presence of Rochester Public Utilities personnel within one week after completion of pressure and leakage testing to document electrical conductivity of the watermain.

All watermain, valves, fittings, and hydrants shall be tested for electrical conductivity and current capacity. The test shall be conducted while the watermain is at normal operating pressure. Backfilling shall have been completed. The watermain may be tested in sections of convenient length as approved by Rochester Public Utilities.

Direct Current (315 – 385 amps) shall be passed through the watermain for five minutes. Current flow through the watermain will be measured continuously on a suitable ammeter and shall remain steady without interruption or excessive fluctuation throughout the 5-minute test period.

Insufficient current or intermittent current or arcing, indicated by large fluctuations of the ammeter needle, will be evidence of defective conductivity in the watermain. The cause shall be isolated and corrected. Thereafter, the section in which the defective test occurred shall be retested.

Direct current arc welders will typically be the source of direct current for this testing. Conductivity testing equipment shall be furnished by the Contractor, subject to the approval of Rochester Public Utilities.

Cables from the current source to the section of watermain under test shall be of sufficient size to carry the test current without overheating or excessive voltage drop.

Conductivity testing connections for the test shall be made at fire hydrants. Hydrants used for a test shall be in the open position with the caps on during the test. The cable shall be clamped to the hydrant standpipe and flange bolt. The hydrant-operating nut shall not be used as a terminal during the test.

When conducting a conductivity test, the current control should be set a minimum before starting. After starting the test, gradually increase the current until the current indicated on the ammeter is at the desired test value. Caution: the voltage drop across a defective watermain joint may be in the order of 50-100 volts.

W200.305 Placing Watermain In-Service or Suspension of Service

All water system valve operations are to be done by Rochester Public Utilities personnel.

When it becomes necessary to close off any section of watermain in place or in service for the purpose of making connections to the section in place or for any other purpose, the Contractor shall notify all consumers connected to, and receiving water service from that section of watermain at least one hour in advance of the shutting off of service. Contractor's work, during the suspension of service, shall be so arranged and conducted so as to reduce to a minimum the time necessary for any suspension of existing service. In no case shall existing water service be suspended overnight.

SERVICE CONNECTION
SPECIFICATIONS
C150

Rochester, MN

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Section 2 MATERIALS

C150.201 General

Upon the City Engineer's request, representatives of the City shall not be denied access to the manufacturing or processing plants for the purpose of making appropriate inspections and tests.

At the City Engineer's request, the Contractor shall furnish manufacturer's certificate that the pipe, fittings, and other specified material meet the specified standards.

C150.202 Water Service Material

Water pipe and fittings for services larger than 2 inches inside diameter shall be designed and installed in accordance with the City of Rochester Standard Specifications for Watermain Construction.

Water service pipe shall be 1 inch, 1-1/2 inch or 2 inch inside diameters only and shall conform to the requirements of ASTM B88 for Seamless Copper Water Tube, Type K, Soft Annealed Temper. Water service pipe of ¾ inch and 1-¼ inch diameter shall conform to the requirements of ASTM B88 for Seamless Copper Water Tube, Type K, Soft Annealed Temper and may only be used for repairs to copper services of ¾ inch and 1-¼ inch diameter.

A. Curb Stop and Box

1. Curb stop valves shall be of the flare type fitting or compression type fitting and shall be one of the following and specifically for the use with copper inlet and outlet service pipe. All curb stop valves shall be threaded and conform to the Minneapolis Pattern.
   (a) Mueller H-15154, Mueller H-15155, Mueller B-25154, or Mueller B-25155.
   (b) McDonald 6104 or McDonald 6104-22.
   (c) Ford B22-444 (1"), Ford B22-666 (1 1/2"), Ford B22-777 (2") or Ford B44-444 (1"), Ford B44-666 (1 1/2"), Ford B44-777 (2").
   (d) Curb box shall be Mueller H-10300, McDonald 5614 or 5615, or equal, which can be extended from 72" to 84" height and shall conform to the Minneapolis Pattern.
2. Where curb boxes are placed in paved areas, a curb box cover per Detail Plate 1-06 shall be installed.

B. Corporation Stop

1. Corporation Stops shall be the flare type fitting or compression type fittings and shall be one of the following, or approved equal:
2. Mueller H-15000, B-25008, or Mueller H-15008 (1"), Mueller H-15013 (1 ½" & 2")
3. Ford F-600 (1"), FB-600 (1 ½" & 2") or Ford F-1000 (1"), FB-1000 (1 ½" & 2")
4. McDonald 4701 or McDonald 4701-22

C. Service Saddles for 1-1/2 inch & 2 inch Services.

1. Service saddles shall be double strap ductile iron saddles with neoprene ring gaskets. The saddles shall be Mueller DB2A, Smith Blair 313 or approved equal.

D. Meter Stop Valves

1. One inch Meter Stop Valves shall be Mueller H-14255, Ford KV23 444 or Ford KVT23 444, McDonald 4601 or 4602 or equal, ground key angle stop with swivel nut, threaded for use with flared copper inlet water service pipe and 3/4" inside iron pipe thread for outlet.

2. 1-1/2 inch and 2 inch Meter Stop Valves shall be Mueller H-14276, McDonald 4602B, Stockman, or Nibco, 125-psi full flow, gate or ball valves.

3. 3 Piece Brass Couplings

   1 inch and 1-1/2 inch coupling shall be flare or compression type fittings. 2-inch couplings shall be compression type fittings. Couplings shall be one of the following or equal:

   (a) Mueller 15400 or Mueller 15403.
   (b) Ford C22 Series or Ford C44 Series.
   (c) McDonald 4758 or McDonald 4758-22.

C150.203 Sanitary Sewer Service Material

Sanitary sewer pipe and fittings for services larger than 6 inches inside diameter shall be designed and installed in accordance with the City of Rochester Standard Specifications for Sewer Construction.

1. Plastic Sewer Service Pipe shall conform to the following:
   (a) Polyvinyl Chloride (PVC) Schedule 40 conforming to ASTM D 1785 (for use at building line only).
   (b) Polyvinyl Chloride (PVC) SDR 26 conforming to ASTM D 2241 (not permitted within 1 foot of footing).
   (c) Polyvinyl Chloride (PVC) SDR 35 or SDR 26 conforming to ASTM D 3034 (not permitted within 1 foot of footing).
   (d) Cast iron soil pipe and fittings shall be the "Service Weight, Centrifugally Spun" grade and shall conform to ASTM A74-75.
   (e) Ductile iron pipe shall conform to ANSI 21.51.
2. All joints shall be gasketed and shall be watertight.
3. Connections to mains or risers shall be made using factory made fittings or commercial adapters. Bends shall be one-eighth (45) bends or less.
4. Sanitary sewer service connections shall be plugged at the end of the service connection. Plugs shall withstand the air test pressures. DIP plugs shall not be sealed with adhesives. Plugs shall be placed at the property line or at the building site and shall be as follows:
   (a) For 4 inch DIP or CIP Service, use 4" Moeller Twis-Tite with brass tee or 4" Expandable Dollar Plug
   (b) For 4 inch PVC Service, use 4" Expandable Dollar Plug or 4" plastic PVC cap
   (c) For 6 inch DIP or CIP Service, use 6" C.I. Blind Plug with rubber gasket
   (d) For 6 inch PVC, use 6" PVC cap.
5. Suitable adapters shall be used for joining dissimilar materials or for repair of similar materials and shall be the shear banded coupling type. The adapters shall be manufactured of material generally conforming to the material requirements of ASTM C-425 and the bands shall be stainless steel. Shear bands are not required to connecting dissimilar pipe materials for which shear-banded couplings are not normally manufactured and in these cases the adapter shall be encased in a concrete collar. The adapter inserts and couplings shall be as manufactured by Fernco or Can-Tex or equal.
6. Service saddles shall be a single band with a single draw point. The saddles shall be Fernco "E-Z Tap" or approved equal.

C150.204 Sanitary Sewer Service Pipe Bursting Material

This material is only approved for repair/replacement of existing sewer services. Sanitary sewer service pipe bursting material shall conform to the requirements of solid wall HDPE, SDR 17.

C150.205 Storm Sewer and Drain Service Material

Storm sewer and drain service pipe located within 10 feet of water service or watermain shall meet the Sanitary Sewer Service material specifications.

C150.206 Backfill Material

Granular backfill shall comply with Mn/DOT section 3149.2D.except that in addition not more than 50% of the material shall pass the No. 40 sieve.

Select Material for Backfill shall be sandy loam, sand, or gravel material approved by the Department of Public Works.

Aggregate for pipe foundation shall comply with Mn/DOT Section 3137 CA-3.

Fine filter aggregate shall comply with Mn/DOT Section 3149.2 J.

Bedding and embedment aggregate Mn/DOT Section 3138, Class 5 containing crushed particles.

Any other miscellaneous material required in the work, but which is not specifically mentioned in these specifications, shall be new, unused, undamaged, and of a quality equal to the materials specified herein and shall be submitted to, and approved by, the City Engineer prior to its use.

Section 3 CONSTRUCTION REQUIREMENTS

C150.301 Public Utilities

The Contractor shall be responsible to protect any existing utility from damage caused by or occurring during their operations. If the work requires excavation, the Contractor shall notify all utility owners by requesting on site utility locations using the state 'Gopher One-call' system. Repair of damaged utilities shall be at the Connection Contractor's expense.

The locations of underground facilities shown on the plans are approximate only, and are shown only for the Contractor's general information. The city does not assume responsibility for showing all utilities on the plans. The Contractor shall use suitable precautions to prevent damage to pipes, conduits, and other underground or overhead structures.

The Construction shall provide for the continued flow of all watercourses, sewers, gutters, and drains, in a manner subject to the approval of the City Engineer, during the service connection work.

C150.302 Limits of Excavation and Restoration

The Contractor shall disturb only that portion of the street and public or private property necessary for the prosecution of the work and consistent with the Street Opening Permit conditions.

The Contractor shall cause a minimum of inconvenience to persons residing near the improvement. The Contractor shall protect all excavations by barricades, lights and other warning devices. All warning devices shall be placed and conform to Minnesota Manual on Uniform Traffic Control Devices.

Within the City's right of way, the Contractor shall not disturb or damage any shade trees or hedges, except by specific written order of the City Engineer. On private property, the Contractor shall not disturb or damage any shade trees or hedges, except with written authorization of the property owner. The setting and marking of stakes shall not be considered such order.

When service connections are installed prior to rough grading, a minimum of 4' of earth fill shall be placed over the pipe. The final earth cover shall be not less than 7 feet for water services and 8 feet for sanitary sewer services.

Upon completion of the service connections, the public and private property shall be restored to the equal or better condition than prior to commencing work.

The maximum length of open trench will be the distance necessary to accommodate the amount of pipe installed in a single day. To the extent practical, trenches shall be fully backfilled each day. At any time a trench is unattended, the entire trench shall be protected with a minimum of 4-foot high snow fence.

C150.303 Trench Excavation

Contractor is responsible to comply with current provisions of the Department of Labor and Industry Occupational Safety and Health Rules.

The trench shall be opened along the lines laid out and to a depth necessary for the laying of pipe at the grades shown on the Plans or approved by the City Engineer. The width of trenches shall provide adequate space for workmen to place and joint the pipe properly and to compact the earth below the haunches of the pipe. The width of the trench, measured at the top of the pipe, shall be no wider than 36".

Solid rock shall be defined as ledge rock or other rock or boulders exceeding 1/3 cubic yard in volume which requires blasting or other extraordinary methods for its removal. Whenever solid rock is encountered in the trench, the City Engineer shall be notified immediately so that the contour of the rock can be determined before its removal. The classification and calculation of the amount of rock excavated shall be determined by the City Engineer and their decision in the matter shall be final. Rock shall be

excavated to provide a clearance of at least 6 inches below all parts of the pipe. The rock excavation width for a common water and sanitary sewer service shall be 36 inches.

Whenever the trench is excavated below the designated pipe bedding grade, whether in rock or otherwise, special backfill is required. All depressions below grade shall be backfilled with approved material and thoroughly compacted before the pipe is laid.

The Contractor shall provide suitable means for the removal of ground water and surface water. In no case shall this water be allowed to flow into the sanitary sewer pipe. Storm sewer may be used for ground water and surface water with the permission of the City Engineer. When quicksand or other unsatisfactory foundation soils are encountered, the Contractor shall immediately notify the City Engineer.

Sheeting and bracing shall be provided in all trenches whenever it is necessary for compliance with OSHA requirements, for the safety of the workmen, or for the protection of the work inplace, or when specified by the Plans or Special Provisions.

C150.304 Bedding and Encasement

Bedding for service connections shall be full encasement extending not less than 4 inches below the pipe and 12 inches above the pipe. Bedding and encasement material shall be accurately shaped by means of a template to fit the lower part of the pipe exterior for at least 60% of the outside diameter or span of the pipe before placing the pipe.

If the foundation at the established grade for the bottom of the pipe or structure is unstable, the trench shall be subcut to a depth designated by the City Engineer. The side slopes of the trench below invert grade shall be excavated as nearly vertical as practicable. The subcut shall be backfilled to the invert of the pipe using Aggregate for Pipe Foundation.

Subcut backfill shall be placed in layers not to exceed 12 inches and thoroughly compacted.

Class "A" bedding shall consist of continuous concrete cradle having a minimum thickness under the pipe of 1/4 the normal inside diameter or span and extending up the sides of the pipe for a height equal to 1/4 the outside diameter or rise. The cradle shall have a width at least equal to the outside diameter or span of the pipe plus 8" and shall be constructed monolithically. Concrete for Class "A" bedding shall be as indicated on the Plans or in the Special Provisions.

For Perforated Pipe the bedding material will conform to the requirements for fine filter aggregate (C150.207D) and shall be placed to 24 inches above the top of the pipe.

Ductile Iron pipe shall be bedded on a soil foundation shaped to fit the lower part of the exterior of the pipe for a width of at least 50 percent of the outside diameter of the pipe.

C150.305 Sanitary Sewer, Storm Sewer and Drain Pipe Installation

A. Grading and Aligning Pipe

1. Service connection pipe shall be laid to line and grade and in the location shown on the Plans or as determined by the City Engineer.
2. Work done without proper location from base lines, offset stakes, bench marks, or other basic reference such as provided by modern line and grade control equipment shall removed and replaced at the Contractor's expense.
3. Dropping, jolting, striking, or other such methods of manipulating pipe to proper grade and alignment will not be permitted.
4. Sanitary sewer service pipe shall have a fall of not less than 1/4 inch to the foot for 4" pipe and 1/8 inch per foot for 6-inch pipe, except as specifically approved by the City Engineer.

5. A 4"x4" wooden post, extending one foot above grade, shall be placed by the pipe invert plug to mark the location of the pipe, when installed at a separate location from the water service.

B. Placing Sewer Pipe

1. Each section of service connection pipe (sanitary sewer, storm sewer, or drain) shall have a firm and uniform bearing throughout its entire length.
2. The ends of sewer service connections shall be sealed with a plug conforming to the requirements of Section C150.203 in this specification. Sub-drains will be plugged with a 2" detectable PVC cap. Pipe shall be laid with the bell or grooved end upgrade.
3. Installing PVC Pipe
   (a) PVC pipe shall be bedded and encased using specified materials. Pipe placement shall be in accordance with the pipe manufacturer's recommendations.
   (b) The maximum allowable radial deflection shall be 5% of the diameter of the pipe.
   (c) PVC sub-drain pipe shall be laid with the perforation down.
4. The sanitary sewer service pipe risers shall be constructed in accordance with the City Standard Detail Plates.
5. Cleanouts shall be placed at a maximum 100-foot intervals.
6. Connections with Mains or Structures
   (a) Sanitary Sewer Service connections shall be made at the main using tees, wyes, or City installed taps. Manhole connections will be permitted only where approved by the City Engineer.
7. Storm Sewer Connections
   (a) Connections to storm sewers shall be made with manholes, junction boxes, tees or cut-ins in accordance with the applicable standard detail plates of the City of Rochester.
   (b) Near a tee or wye, where compression joint cannot be made with a commercial adapter, the connection shall be made by tapping the main. The existing connection shall be abandoned by plugging within 5 feet of the main.
   (c) Sewer services to be abandoned in place shall be disconnected and plugged with a pressure plug or the end filled with concrete at the property line. A compression plug shall be used when disconnecting at the wye or tee connection.

C. Pipe Bursting

1. Retrofitting existing sewer services by the Pipe Bursting Method shall follow the manufacturers guidelines for installation.
2. Any damages to existing pipe main or structures shall be included in the retrofit.

C150.306 Water Service Installation/Abandonment

A. Grading and Aligning Pipe

1. Service connection pipe shall be laid to line and grade and in the location shown on the Plans or as determined by the City Engineer.
2. Work done without proper location from base lines, offset stakes, bench marks, or other basic reference such as provided by modern line and grade control equipment shall removed and replaced at the Contractor's expense.
3. Dropping, jolting, striking, or other such methods of manipulating pipe to proper grade and alignment will not be permitted.

B. Copper Water Service

Copper Water Service pipe may be spliced only with a brass union. Copper Water Service pipe shall not be spliced except as follows:

1. When the length of 1-inch water service between the curb stop and the water meter connection exceeds 100 feet. Only one splice will be permitted for each addition 100 feet of service.
2. When the length of 1 ½ inch water service between the curb stop and the water meter connection exceeds 60 feet. Only one splice will be permitted for each addition 60 feet of service.
3. When the length of 2-inch water service between the curb stop and the water meter connection exceeds 40 feet. Only one splice will be permitted for each addition 40 feet of service.
4. When a copper service is repaired, a minimum number of splices will be permitted.
5. During water main replacements, one splice will be permitted on services running to the side of the new water main on which the existing water main lies.

Water service taps on watermains shall be tapped at 45 degrees on the appropriate upper quadrant of the main. A distance of at least 12 inches shall separate taps and no tap shall be made within 12 inches of a pipe joint. Corporation threads shall be wrapped with double wrap of three mills Teflon before installation. 1-1/2inch and 2 inch service pipe shall have a 45 degrees bend connected to the corporation stop to facilitate the downward expansion loop. Corporation stops for 1-1/2 inch and 2-inch services shall be connected to the main with a double strap ductile iron service saddle. Immediately after the water service connection has been placed from the main to the curb stop and the curb stop installed, it shall be flushed with water from the main by having the curb stop valve in the fully opened position.

Small lead, galvanized iron or copper water services to be abandoned shall be disconnected by closing the corporation stop at the main. The pipe shall be cut off one foot from the corporation stop, pinched closed, and the curb box riser section removed. Larger cast iron or ductile iron services shall be abandoned as follows: Tapping sleeves and lead caulked joint tees shall be cut out and replaced with a new section of watermain; for mechanical joint type tees, the service pipe shall be removed and a mechanical joint plug installed.

C. Water Service Appurtenances

1. Curb Box
   (a) Curb boxes shall be set in the collapsed position 1' below finished grade in areas where finish grading is yet to be completed. After completion of the finished grading, the upper box section shall be raised and the curb box operated to verify proper alignment.
   (b) In areas where the finished grade is established the curb box shall be adjusted to the Extended position and set to finished grade and the curb box operated to verify proper alignment.
   (c) Prior to setting of curb box the metal stops of curb box upper section shall be removed and the split-locking ring in base section shall also be removed.
   (d) A 4"x4" wooden post, extending one foot above grade, shall be placed by the curb box to mark the location of the box.
2. Curb Stop
   (a) A concrete brick shall be placed immediately below the curb stop for it to rest on.
   (b) Where the water service is not being extended to the building immediately, the open end of the curb stop shall be protected by installing a 12-inch long piece of copper and smashing the end of the copper. Alternate cap methods require approval of the City Engineer and must prevent soil from entering the copper pipe and minimize the water leak should the curb stop be accidentally opened.

C150.307 Record Location

The Contractor shall keep accurate record of wye; curb box and corporation stop locations. Upon completion of service construction the sheet shall be submitted to the City Engineer.

C150.308 Trench Backfilling

All trenches shall be backfilled as soon as practicable. Compaction by "Compacted Trench Backfill" method, as specified below, will be required on all service connection construction.

When suitable material is not available from project excavations the City Engineer may order the procurement of select material for backfilling or for blending with existing material. The quantity and quality of the imported selected material shall be subject to the approval of the City Engineer.

Placing and compacting of trench backfill including blending of materials, adding moisture or drying of materials, and procuring suitable materials from excavations within the project shall be considered as incidental to trench excavation or to the items for pipe.

C150.309 Compacted Trench Backfill

Bedding and encasement material shall be carefully placed by hand methods and tamped around and over the sewer and water connection to a depth 1-foot above the top of the pipe. The remainder of the backfill shall be placed in layers of uniform depth not exceeding 12 inches per layer and compacted to City Standards.

Backfill material shall be Select Material for Backfill as defined in Backfill Material Section of this specification, except that whenever a 'street cut' is required, Granular Backfill Material shall be used in and within 3 feet of the right of way line.

Backfill material placed within 3 feet of subgrade shall be compacted to a density of not less than 100 percent of maximum density and the relative moisture content shall be not more than 102 percent of optimum moisture content. Subgrade shall be defined for this section as the elevation of the bottom of any aggregate material placed for pavement or sidewalk or the bottom of the topsoil for turf establishment.

Backfill material placed more than 3 feet below the subgrade shall be compacted to a density of not less than 95 percent of maximum density and the relative moisture content shall be not more than 115 percent of optimum moisture content.

Maximum density and optimum moisture shall be determined using the methods described in the current edition of the Mn/DOT Grading and Base Manual.

C150.310 Resurfacing and Restoration of Public and Private Property

A. Street and Alley Resurfacing and Restoration

1. The terms and requirements indicated in the City Street Opening Permit, issued for this project shall govern. The following requirements shall apply except if in direct conflict with the listed permit conditions.

2. Adequate protection shall be afforded to ensure the safe prosecution of the work with minimum of inconvenience to safe public vehicular and pedestrian traffic. Barricades, warning lights, and other traffic control signs and devices shall be placed and maintained in accordance with the Manual of Uniform Traffic Control Devices and as directed by the City Traffic Engineer. At least one lane of traffic shall be maintained at all times unless specific authorization is received form the City Traffic Engineer. Any time traffic is closed to one lane, the Contractor shall provide flaggers the direct the flow of traffic.

TRENCH EXCAVATION, BACKFILL & SURFACE RESTORATION SPECIFICATIONS
T100

Rochester, MN

Section 4 METHOD OF MEASUREMENT

T100.401 Description

All items will be measured separately according to design designation as indicated in the Pay Item name and as may be detailed and defined in the Plans, Specifications, or Special Provisions. Complete-in-Place items shall include all component parts thereof as described or required to complete the unit, but excluding any excesses covered by separate Pay Items.

T100.402 Trench Excavation

A. Trench Depth Increments

Trench excavation will be measured in linear feet of trench, according to the depth zone classification specified as follows:

From 0 to 8 feet
From 8 to 10 feet
From 10 to 12 feet
From 12 to 14 feet
From 14 to 16 feet
From 16 to 18 feet

Linear measurement for trench excavation will be made along the centerline of the trench to the nearest foot from center to center of manholes, catch basins, or junctions.

B. Trench Depth Measurement

The depth of trench shall be measured according to the following provisions:

In those areas where the lowering of the existing ground profile is required as part of the same project, the depth of the trench shall be from the established subgrade profile at the centerline of the trench to the established sewer invert grade.

In those areas where no lowering of the existing ground profile is required as part of the same project, the depth of the trench shall be that distance from the existing ground line to the established sewer invert grade.

T100.403 Rock Excavation

Rock Excavation shall be measured by volume in cubic yards. Depth shall be measured from the top of the rock to a point six-inches below the outside barrel of the Pipe and width shall be the outside diameter of the pipe plus twenty-four-inches (12" from each side). The minimum width of measurement shall be three feet.

T100.404 Granular Materials

Granular materials furnished and placed as special foundation, bedding, encasement, or backfill construction will be measured by weight or volume of material furnished by the Contractor from outside sources and placed within the limits defined. Unless otherwise specified, volume will be determined by vehicular measure (loose volume) at the point of delivery. Measurements will not include any materials required to be placed as a component part of other Contract Items as may be specified.

T100.405 Piling

Piling shall be measured according to the provisions of Mn/DOT Specification 2452.

Pile bents shall be measured as a unit and shall include all materials and labor required, except the pile.

T100.406 Sheeting

Sheeting shall be measured on a square foot basis. Sheeting ordered left in place will be measured and paid for by the square foot of the overall area of the front face of the sheeting including the cut-off sections, if any.

T100.407 Insulation

Rigid board insulation shall be measured on a square foot basis installed to the specified thickness noted on the Plans, Detail Plates, or Special Provisions and shall include all materials, equipment, and labor required for placement.

T100.408 Geotextile Fabric

Where geotextile fabric is used for improving pipe foundation it shall be measured by the square foot of material installed.

T100.409 TrenchlessWatermain

Trenchless Watermain of each kind and size will be measured separately to the nearest foot, by the overall length along the axis of the pipeline, from beginning to end of each installation and without regard to intervening valves or specials. Terminal points of measure will be the spigot or cut end, base of hub or bell end, center of valves or hydrants, intersecting centers of tee or wye branch service connections, and center of corporation stop or curb stop couplings.

T100.410 Furnish &Install Steel Carrier Casing (Open-cut)

Steel Casing will be measured by linear foot along the line of casing.

T100.411 Furnish &Install Steel Carrier Casing (Jack & Auger)

Steel Casing will be measured by linear foot along the line of casing.

ENGINEERING
STANDARDS

For Public Works in Conjunction with the Development of Subdivisions, Commercial & Industrial Property

City of Rochester
Public Works Department

TABLE OF CONTENTS

TABLE OF CONTENTS

1. Ponds shall incorporate multi-stage outlets as necessary to limit the 2-year, 10-year and 100-year peak discharges to less than the pre-development discharge. Outlets shall provide skimming of at least the 2-year event.

2. Ponds shall include a water quality "extended detention" hydraulic volume equal to the volume from 1/2" of runoff from the impervious portion of the developed watershed, per MPCA permit requirements. The extended detention volume shall be above the pond normal water level. When the pond water level is at the extended detention elevation, the discharge shall not exceed 5.66 cfs/acre of pond surface area. The discharge rate shall be adequate to draw down the extended detention volume in less than 48 hours, to prevent vegetation kill.

3. Ponds shall include a water quality "dead storage" quiescent settling volume at least equal to the developed pond watershed runoff from a 1.8" 6-hour rainfall event, per the Rochester Storm Water Management Plan. The dead storage volume shall be below the pond normal water level. The watershed 1.8" 6-hour runoff depth shall be interpolated from the following table, based on the developed pond watershed runoff curve number.

CN	66	68	70	72	74	76	78	80	82	84	86	88	90
Runoff (in.)	0.21	0.24	0.28	0.335	0.39	0.45	0.515	0.59	0.67	0.75	0.85	0.945	1.06

4. In addition to the dead storage water quality volume indicated above, the pond shall have at least the 20 year dead sediment storage volume (below the pond normal water level) per the following table:

Land Use	20 Year Sediment Vol. (Cu. Ft/Acre)
Low Density Residential	265
Medium Density Residential	343
High Density Residential	419
Commercial	497
Industrial	443

5. The pond plans shall include tabulation of the following data: Watershed Area (ac) *[total pond watershed including watershed of any upstream ponds]*; NWL Normal Water Level (ft); NWL Pond Surface Area (ac); NWL Pond Volume (a-f); 100-Yr High Water Level (ft); 100-Yr Bounce Volume (a-f); 100-Yr Peak Discharge (cfs); 10-Yr Peak Discharge (cfs); 2-Yr Peak Discharge (cfs); Dam Height (ft) *[toe of downstream side of dam to top of dam]*; and Maximum (Breach) Volume (a-f) *[at top of dam elevation, not including any volume below the elevation of the downstream toe of the dam]*.

Available references for pond design include:

1) "Protecting Water Quality in Urban Areas – Best Management Practices" published by the MPCA available at: http://www.pca.state.mn.us/water/pubs/sw-bmpmanual.html

2) NRCS Conservation Practice Standard 378, "*Pond*" available at: http://www.mn.nrcs.usda.gov/eng/standard/378mn.pdf.

1005.8 Grading Plan Checklist

The City of Rochester Department of Public Works "Grading Plan Checklist" is incorporated herein by reference.

1005.9 Subdrains

Subdrains shall be constructed on both sides of all urban street sections, unless otherwise approved by the City.

Drainpipe shall be a minimum of 4" in diameter and shall be constructed of perforated PVC Mn/DOT spec 3245. The pipe shall be completely wrapped with a geotextile fabric and bedded according to the detail plate.

Pipe slopes in subsurface drainage should be as appropriate for the design, with a minimum of 0.4 percent. Curved alignment of the subdrain is acceptable where the deflection angle of the alignment is not greater than 22.5 degrees, with not more than 2-22.5 degree fittings between structures.

Downstream outlet connections shall be made at elevations 0.5-feet higher than the lowest invert of the Storm Sewer Structure (typically a Catch Basin). If no structure is available, a cleanout shall be installed at the upstream end, consisting of two 45degree risers and enough length of pipe to raise the invert to finish grade. The cleanout shall be capped with a detectable PVC cap screwed to the pipe end.

A 4"x2" wye shall be installed at the same locations as the water and sewer service. Subdrain service connections shall be plugged at the property line or at the building site with a 2-inch detectable PVC cap

1005.10 Future Storm Laterals, Stubs

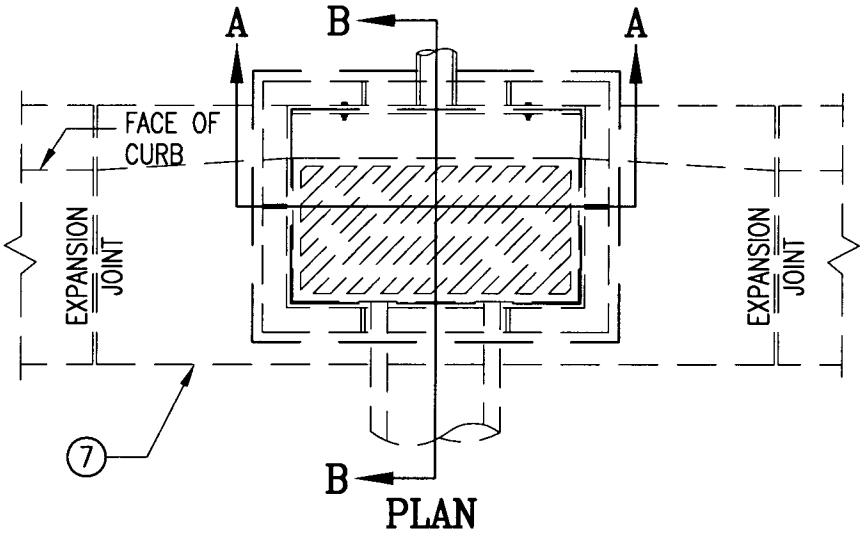
Rochester Code of Ordinances 63.457.2 requires the on-site collection of stormwater runoff before it flows across the public sidewalk. Where the general topography indicates that drainage will flow to the public right of way, on each multifamily, commercial or industrial lot, a storm sewer lateral "stub" shall be extended to the property line.

City of Rochester
Department of Public Works
Standard English Detail Plate Index

Plate No.	Rev.	Title	Date	Sheets
Sanitary & Storm Sewer Structures				
1-01	E	Structure Type 1	4/1/04	1
1-02	E	Structure Types 2, and 2A	4/1/04	1
1-03	F	Structure Types 3 and 3A	4/1/04	1
1-04	E	Structure Type 4 (XXin.)	4/1/04	1
1-05	A	Structure Type 5 (XXin.)	4/1/04	1
1-06	A	Manhole Waterproofing	4/1/04	1
1-07	B	Subsurface Drains	4/1/04	1
1-08	B	Curb Box Cover	1/1/00	1
1-09	G	Casting Schedule	4/1/04	1
1-10	C	Structure Adjusting Rings	8/15/02	3
1-11	B	Blind-Tie Field Connection for R.C.P. Storm Sewer	1/1/00	1
Curb & Gutter, Sidewalk, and Drive Approaches				
2-01	B	Concrete Curb & Gutter	1/1/00	1
2-02	C	Concrete Sill	4/16/01	1
2-03	C	Urban Type Curb and Sidewalk	4/16/01	1
2-04	A	Bituminous Curb	10/1/97	1
2-05	B	Transition Curb & Gutter Driveover to Type B or V	1/1/00	1
2-06	B	Curb & Gutter Reinforcement at Catch Basins	1/1/00	1
2-07	C	Concrete Drive Approach Type A	1/1/00	1
2-08	D	Concrete Drive Approach Type B	4/16/01	1
2-09	D	Concrete Drive Approach Type C	4/16/01	1
2-10	D	Concrete Drive Approach Type D	4/16/01	1
2-11	D	Concrete Drive Approach Type E	4/16/01	1
2-12	G	Pedestrian Curb Ramp	4/1/04	2
2-13	B	Sidewalk Details	8/15/02	1
Typical Sections				
3-01	A	Typical Section 28ft. Roadway (50ft. R.O.W.)	10/1/97	1
3-02	A	Typical Section 32ft. Roadway (56ft. R.O.W.)	10/1/97	1
3-03	B	Typical Section 36ft. Roadway (60ft. R.O.W.)	4/16/01	1
3-04	A	Typical Section 44ft. Roadway (66ft. R.O.W.)	10/1/97	1
3-05	A	Typical Section 44ft. Roadway (80ft. R.O.W.)	10/1/97	1
3-06	B	Typical Section Off-Road Bikeway	8/15/02	1
Utility Services				
4-01	D	Service Connections Stubbed into Boulevard	4/1/04	1
4-02	A	Standard 4in. Riser	10/1/97	1
4-03	B	Street Crossings for Utility Conduits	4/1/04	1

City of Rochester
Department of Public Works
Standard English Detail Plate Index

Plate No.	Rev.	Title	Date	Sheets
Pipe Insulation				
5-01	B	Concrete Insulation & Protection for Underground Pipe	1/1/00	1
5-02	C	Polystyrene Insulation	1/1/00	1
Watermain				
6-01	A	Valve Extension Stem	10/1/97	1
6-02	B	Valve Manhole	4/16/01	1
6-03	B	Pressure Reducing Valve Manhole	4/16/01	1
6-04	B	Hydrant Branch Detail	8/15/02	1
6-05	B	Restrained Joint Detail	4/16/01	1
6-06	A	Polyethylene Encasement	10/1/97	2
6-07	C	Alignment of Watermain at Sewer Manhole in Common Trench	8/15/02	1
6-08	B	Electrical Continuity	4/16/01	1
6-09	A	Installation Detail	10/1/97	1
6-10	A	Fire Hydrant Thread Pattern (4in. Nozzle)	10/1/97	1
6-11	C	Water Service and Meter Setting Details	4/1/04	2
6-12	C	Irrigation System	4/1/04	2
6-13	B	Water Remote Register Multiple Dwelling	4/1/04	1
6-14	B	Water Remote Register Setting Details	4/1/04	1
6-15	B	Backflow Prevention for Water Tankers	4/1/04	1
6-16	A	Typical Fitting Cut-in and Removal Details	10/1/97	1
6-17	C	Bridge Crossing Pipe Hanger Details	4/1/04	1
6-18	A	Hydrant Protective Posts	10/1/97	1
Erosion Control				
7-01	A	Silt Fence Details	4/16/01	1
7-02	B	Ditch Checks	4/1/04	3
7-03	B	Inlet Protection	4/1/04	3
7-04	C	Stabilized Vehicle Exit	4/16/01	1
7-05	A	Turf Reinforcement Mat for Channels	4/16/01	1



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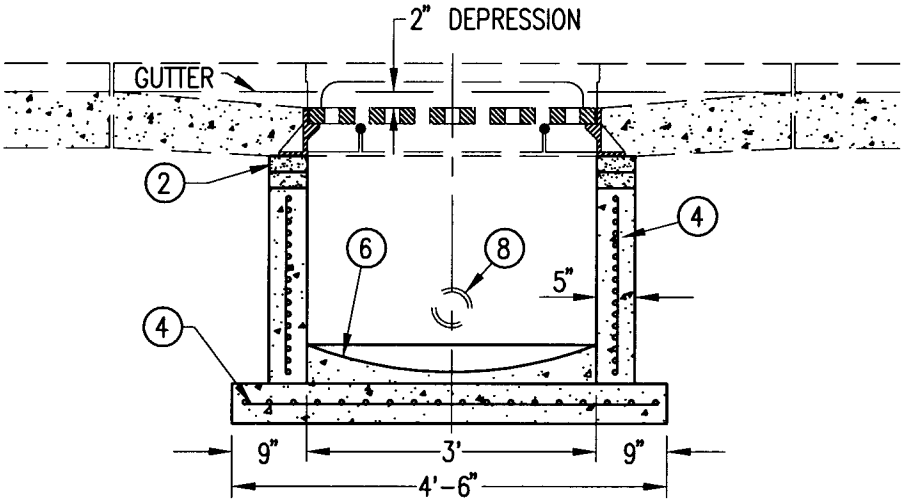
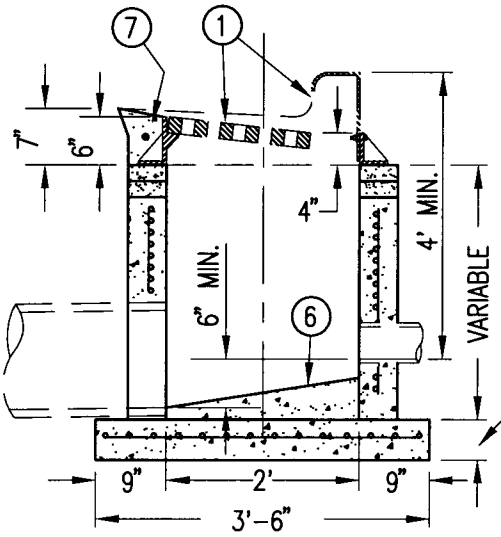


SECTION A–A



SECTION B–B

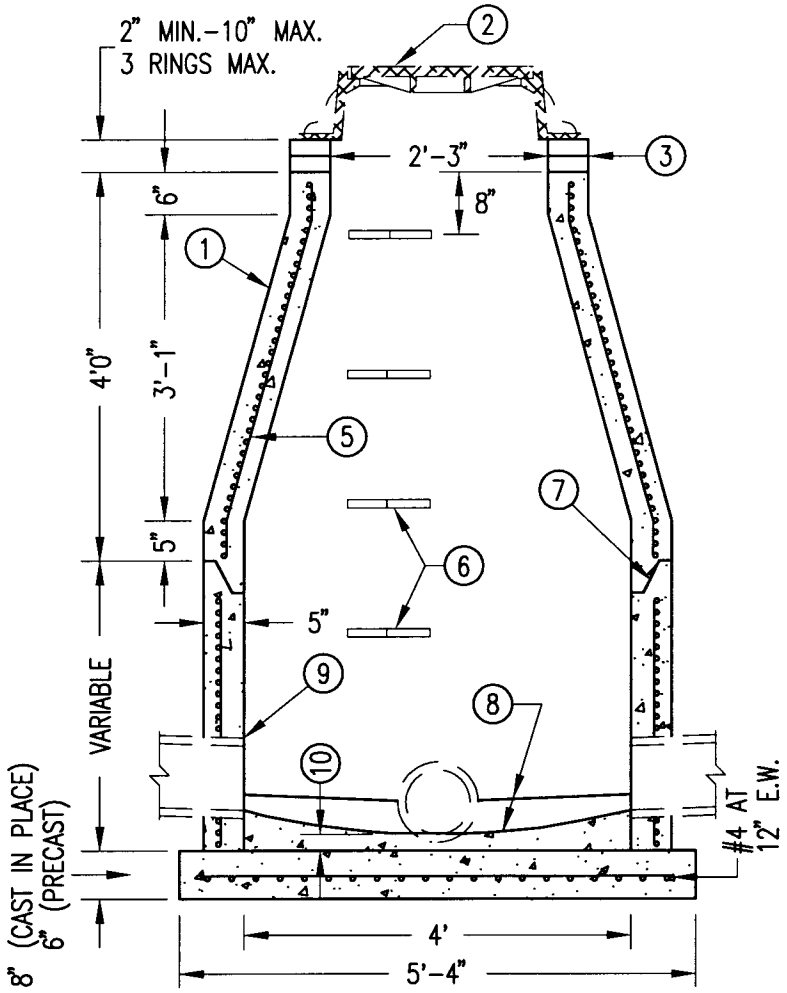
NOTES

1. REFER TO PLANS AND S.D.P. 1–09 FOR TYPE OF FRAME, GRATE AND CURB BOX.
2. ADJ. RINGS SHALL BE PER S.D.P. 1–10, AND BE FULLY MORTARED. HEIGHT OF RINGS SHALL BE 2" MIN.–10" MAX. WITH 3 RINGS MAXIMUM.
3. STRUCTURE SHALL BE PRECAST CONCRETE.
4. REINFORCING SHALL BE A MINIMUM OF SINGLE LINE STEEL WIRE FABRIC HAVING AN AREA OF NOT LESS THAN 0.12 SQ. IN. PER FOOT EACH DIRECTION.
5. NO STEPS REQUIRED.
6. PROVIDE CONCRETE FILLETS TO FIT BOTTOM PORTION OF STRUCTURE AND TO DIRECT THE FLOW TO OUTLET AT MIN. SLOPE OF 1/4" PER FOOT. MINIMUM CONCRETE THICKNESS AT OUTLET 1 1/2".
7. SEE S.D.P. 2–01, 2–05 AND 2–06 FOR CURB, GUTTER AND REINFORCEMENT DETAILS AT CATCH BASINS.
8. SEE S.D.P. 1–07 FOR SUBDRAIN DETAILS AT CATCH BASINS.

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

STRUCTURE TYPE 1

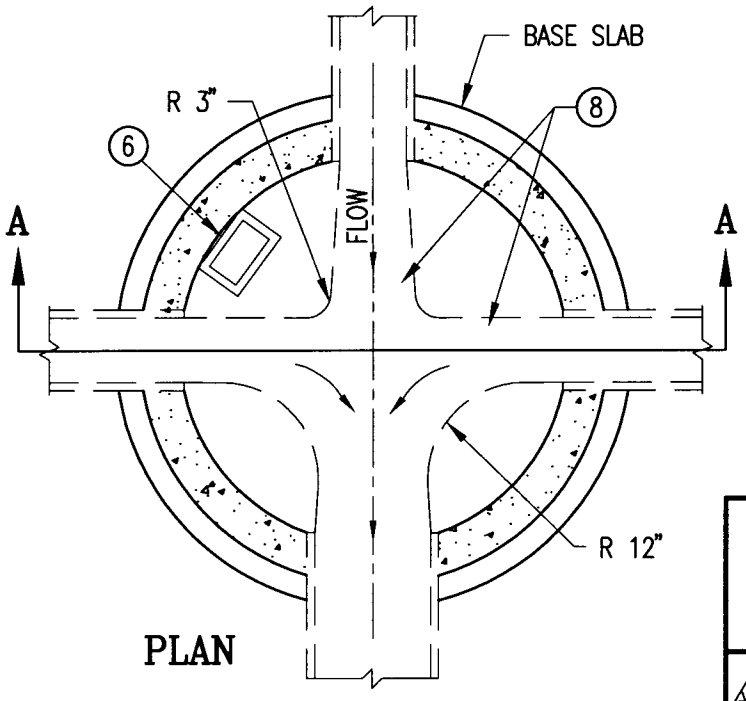
ASST. CITY ENGINEER	DIRECTOR			
SHT 1 OF 1 SHTS	DATE REVISED 4/1/04	PLATE NO. 1–01	REV. E	



SECTION A-A

NOTES

1. CONE SHALL BE CONCENTRIC.
2. REFER TO PLANS AND S.D.P. 1-09 FOR CASTING REQUIRED. CASTING SHALL BE BOLTED TO CONCRETE IN FIELD APPLICATIONS.
3. ADJ. RINGS SHALL BE PER S.D.P. 1-10, AND BE FULLY MORTARED.
4. STRUCTURE SHALL BE PRECAST CONCRETE.
5. REINF. SHALL BE A MIN. OF A SINGLE LINE STEEL WIRE FABRIC HAVING AN AREA OF NOT LESS THAN 0.12 SQ. IN. PER FOOT IN EACH DIRECTION.
6. STEPS ARE SPACED 16" O.C. MAX. AND SHALL CONFORM TO MN/DOT S.P. 4180 J. STEPS SHALL BE ORIENTED ON THE UPSTREAM LEFT SIDE AS SHOWN.
7. ALL JOINTS TO BE GASKETED. REFER TO MN/DOT SPEC. 3726.
8. PROVIDE CONCRETE FILLETS TO FIT BOTTOM PORTION OF PIPE TO DIRECT FLOW TO OUTLET AT 1/4" PER FT. MIN. SLOPE. SHAPE CHANNELS TO HAVE SMOOTH ROUND INVERTS. DEPTH OF CHANNELS SHALL NOT BE LESS THAN 1/2 THE PIPE SIZE.
9. DROP INLET USED FOR SAN. SEWER DROPS GREATER THAN 1.0 FT.
10. MINIMUM CONCRETE THICKNESS AT LOWEST INVERT SHALL BE 1 1/2".
11. STRUCTURE TYPE 3 OR 3A REQUIRED FOR NEW SANITARY SEWER CONSTRUCTION.
12. MAX. PIPE SIZE:
    24" FOR STRAIGHT THRU TO 135°
    18" FOR 90° BEND



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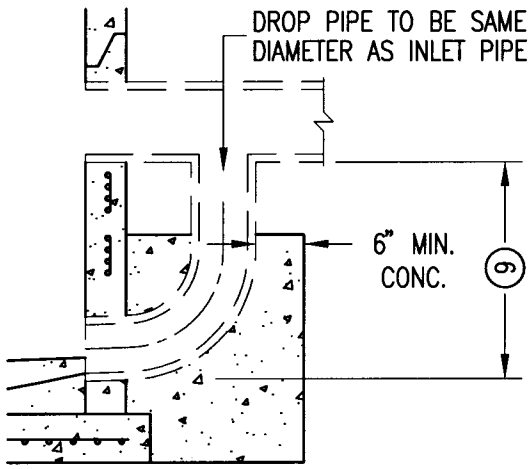
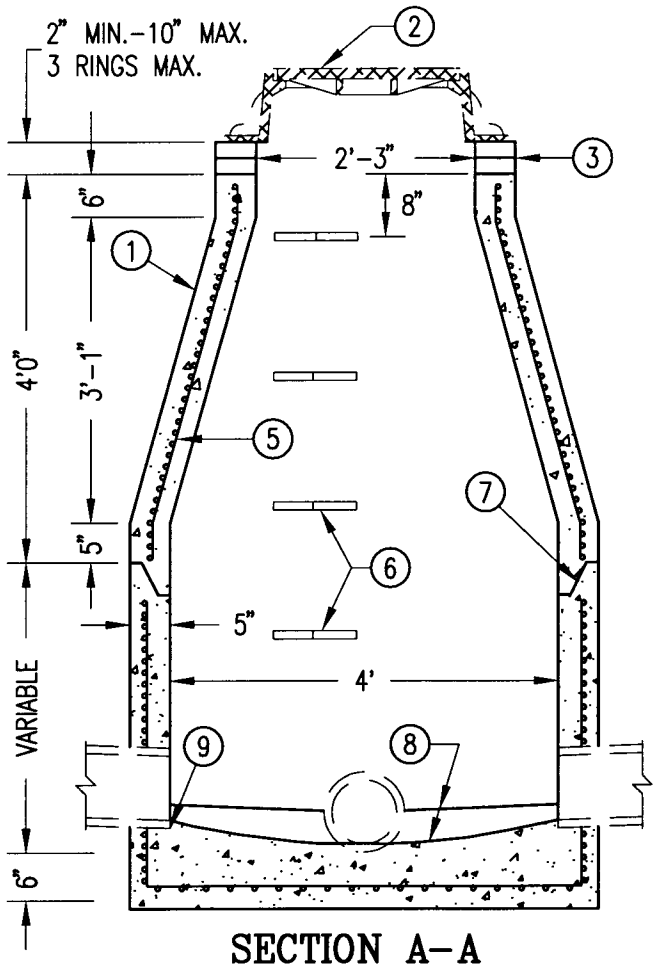


DROP-INLET FOR STRUCTURE TYPE 2A

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

STRUCTURE TYPES 2 AND 2A

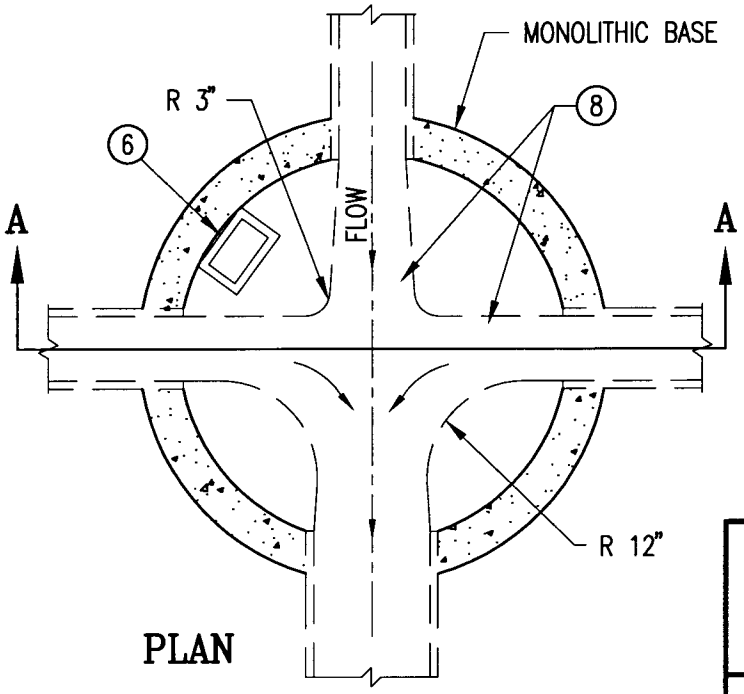
ASST. CITY ENGINEER	DIRECTOR			
SHT 1 OF 1 SHTS	DATE REVISED 4/1/04	PLATE NO. 1-02	REV. E	



SECTION A-A

NOTES

1. CONE SHALL BE CONCENTRIC.
2. REFER TO PLANS AND S.D.P. 1-09 FOR CASTING REQUIRED. CASTING SHALL BE BOLTED TO CONCRETE IN FIELD APPLICATIONS.
3. ADJ. RINGS SHALL BE PER S.D.P. 1-10, AND BE FULLY MORTARED.
4. STRUCTURE SHALL BE PRECAST CONCRETE.
5. REINF. SHALL BE A MIN. OF A SINGLE LINE STEEL WIRE FABRIC HAVING AN AREA OF NOT LESS THAN 0.12 SQ. IN. PER FOOT IN EACH DIRECTION.
6. STEPS ARE SPACED 16" O.C. MAX. AND SHALL CONFORM TO MN/DOT S.P. 4180 J. STEPS SHALL BE ORIENTED ON THE UPSTREAM LEFT SIDE AS SHOWN.
7. ALL JOINTS TO BE GASKETED. REFER TO MN/DOT SPEC. 3726.
8. PROVIDE CONCRETE FILLETS TO FIT BOTTOM PORTION OF PIPE TO DIRECT FLOW TO OUTLET AT 1/4" PER FT. MIN. SLOPE. SHAPE CHANNELS TO HAVE SMOOTH ROUND INVERTS. DEPTH OF CHANNELS SHALL NOT BE LESS THAN 1/2 THE PIPE SIZE.
9. FOR WATER TIGHT SEAL REFER TO MN/DOT S.P. 4007 C.
10. DROP INLET USED FOR SAN. SEWER DROPS GREATER THAN 1.0 FT.
11. MAX. PIPE SIZE:
    24" FOR STRAIGHT THRU TO 135°
    18" FOR 90° BEND



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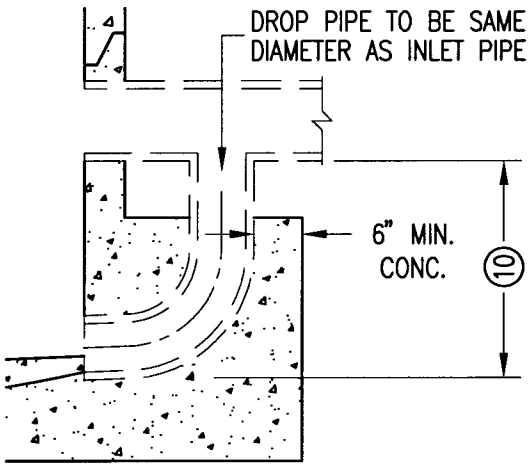
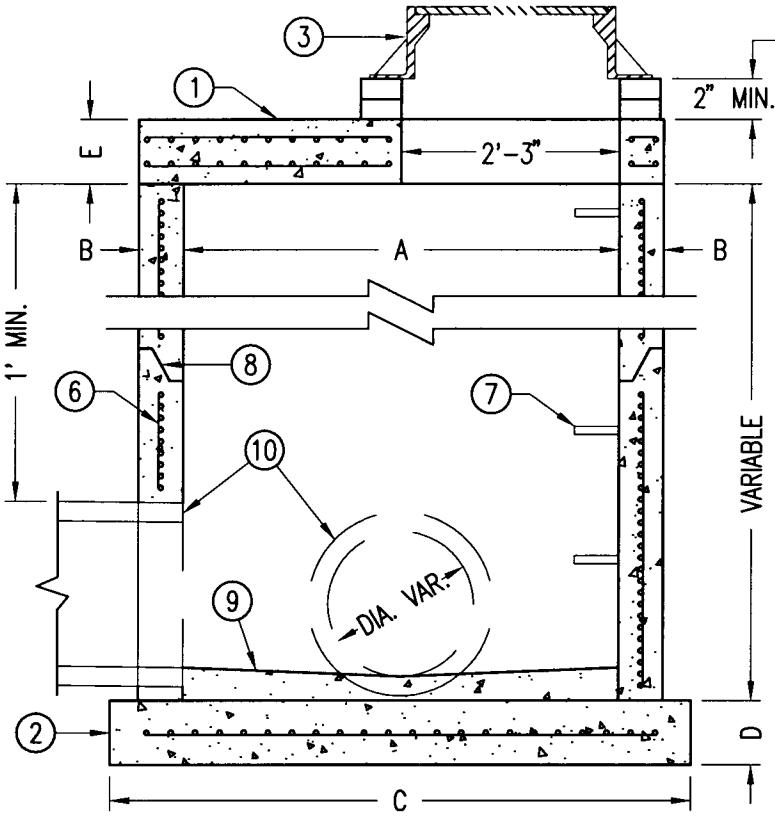


DROP-INLET FOR
STRUCTURE TYPE 3A

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

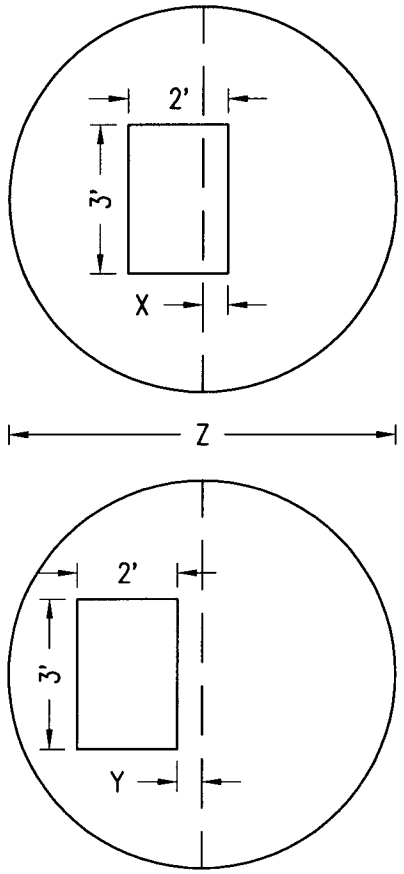
STRUCTURE TYPES 3 AND 3A (SANITARY SEWER)

ASST. CITY ENGINEER	DIRECTOR			
SHT 1 OF 1 SHTS	DATE REVISED 4/1/04	PLATE NO. 1-03	REV. F	



NOTES

1. MANHOLE COVER SHALL CONFORM TO MN/DOT S.P. 4020 I.
2. MANHOLE BASE SHALL CONFORM TO MN/DOT S.P. 4011 E.
3. REFER TO PLANS AND S.D.P. 1-09 FOR CASTING REQUIRED. CASTING SHALL BE BOLTED TO CONCRETE IN FIELD APPLICATIONS.
4. ADJUSTING RINGS SHALL BE PER S.D.P. 1-10, AND BE FULLY MORTARED.
5. STRUCTURE SHALL BE PRECAST CONCRETE.
6. REINFORCING SHALL BE A MINIMUM OF A SINGLE LINE STEEL WIRE FABRIC HAVING AN AREA OF NOT LESS THAN 0.12 SQ. IN. PER FOOT IN EACH DIRECTION.
7. STEPS ARE SPACED AT 16" O.C. MAX. AND SHALL CONFORM TO MN/DOT S.P. 4180 J. STEPS SHALL BE ORIENTED ON THE UPSTREAM LEFT SIDE.
8. ALL JOINTS TO BE GASKETED. REFER TO MN/DOT SPEC. 3726.
9. PROVIDE CONCRETE FILLETS TO FIT BOTTOM PORTION OF PIPE TO DIRECT FLOW TO OUTLET AT 1/4" PER FT. MINIMUM SLOPE. MINIMUM CONCRETE THICKNESS AT LOWEST INVERT SHALL BE 1 1/2".
10. WATERTIGHT SEAL PER MN/DOT S.P. 4007 C. REQUIRED FOR SANITARY SEWER USE.



MH TOP SLAB			MANHOLE DIMENSIONS					MAX. PIPE SIZE	
X	Y	Z	A	B	C	D	E	135°-180°	90°
9"		58"	48"	5"	64"	6"	6"	24"	18"
3"		72"	60"	6"	78"	8"	8"	33"	27"
	3"	86"	72"	7"	92"	8"	8"	36"	33"
	9"	100"	84"	8"	106"	8"	8"	48"	36"
	15"	114"	96"	9"	120"	8"	8"	54"	42"
	21"	126"	108"	9"	132"	9"	12"	60"	48"
	24"	144"	120"	12"	146"	12"	12"	66"	54"

ALTERNATE TOP SLAB FOR MANHOLE

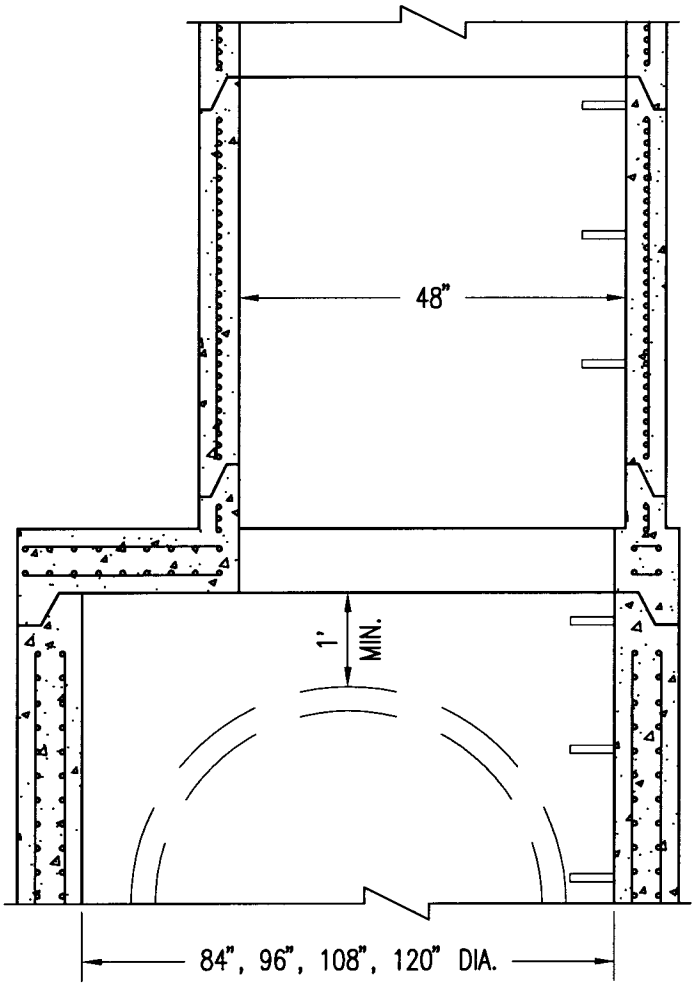
DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

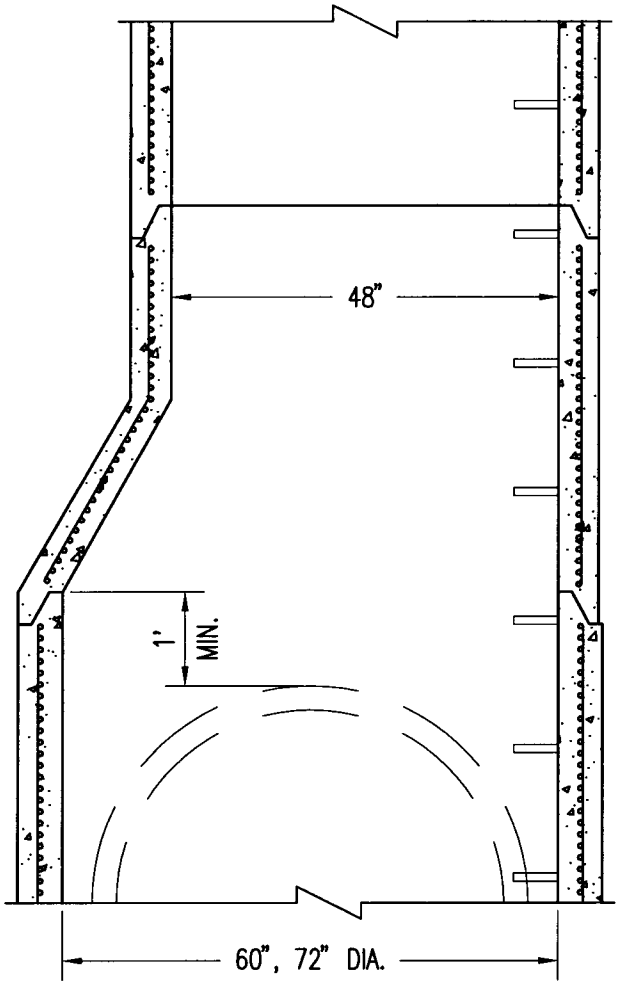
STRUCTURE TYPE 4 (XX in.)

Douglas Nelson
ASST. CITY ENGINEER

Russell W. Fries
DIRECTOR

SHT 1 OF 1 SHTS	DATE REVISED 4/1/04	PLATE NO. 1-04	REV. E



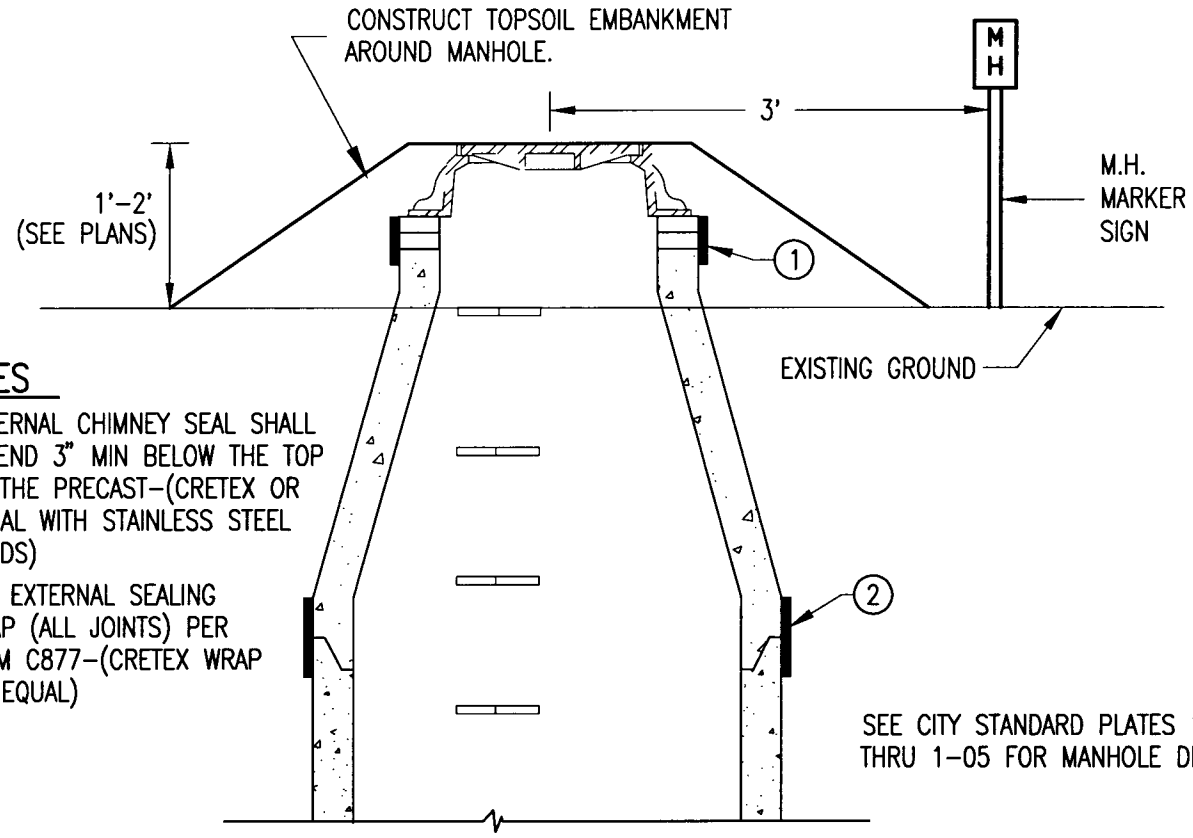


SEE CITY STANDARD PLATES 1-02 THRU 1-04 FOR MANHOLE DETAILS

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

STRUCTURE TYPE 5 (XX in.) REDUCTION MANHOLE

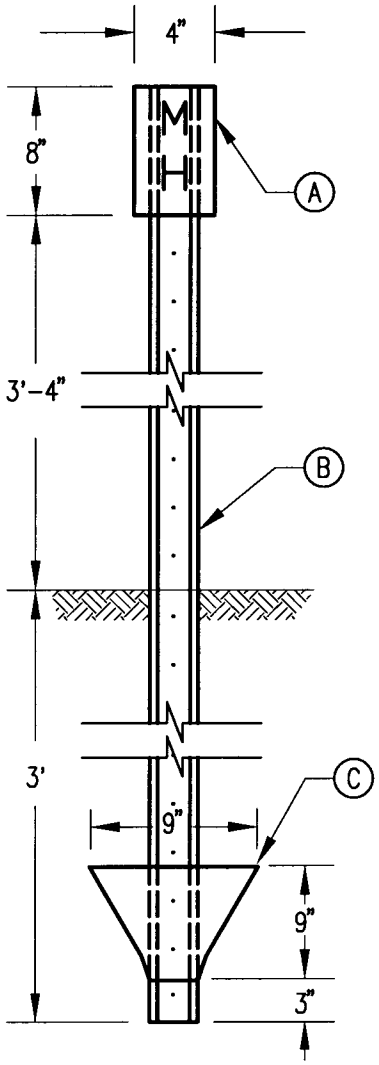
ASST. CITY ENGINEER	DIRECTOR			
SHT 1 OF 1 SHTS	DATE REVISED 4/1/04	PLATE NO. 1-05	REV. A	



NOTES

1. EXTERNAL CHIMNEY SEAL SHALL EXTEND 3" MIN BELOW THE TOP OF THE PRECAST-(CRETEX OR EQUAL WITH STAINLESS STEEL BANDS)
2. 12" EXTERNAL SEALING WRAP (ALL JOINTS) PER ASTM C877-(CRETEX WRAP OR EQUAL)

SEE CITY STANDARD PLATES 1-03 THRU 1-05 FOR MANHOLE DETAILS.



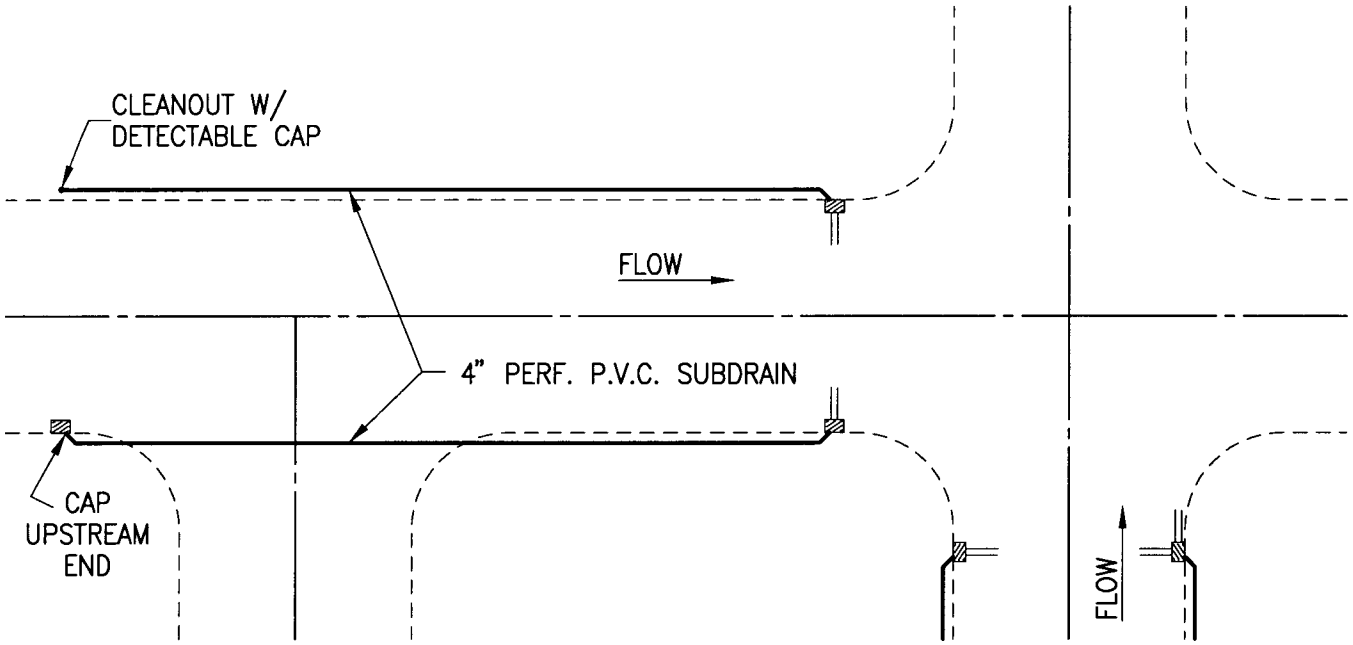
NOTES

- (A) SHEET ALUMINUM SIGN BOLTED TO POST. SIGN SHALL READ "M.H." IN 2 INCH BLACK LETTERS ON WHITE REFLECTORIZED BACKGROUND.
- (B) FLANGED CHANNEL SIGN POSTS SHALL BE A MINIMUM OF 2.75 POUNDS PER FOOT, AND SHALL MEET MN/DOT 3401.
- (C) 1/8" SHEET STEEL SHALL BE ASTM A1011, GRADE D SHALL BE BOLTED OR WELDED TO CHANNEL.

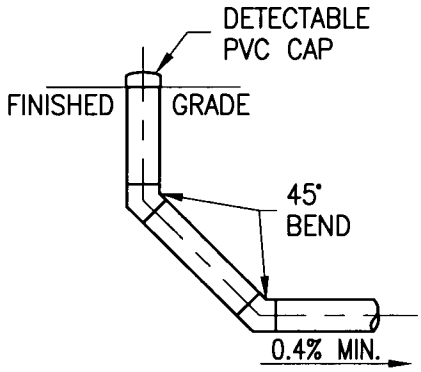
DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

MANHOLE WATERPROOFING (NON-PAVED AREAS)

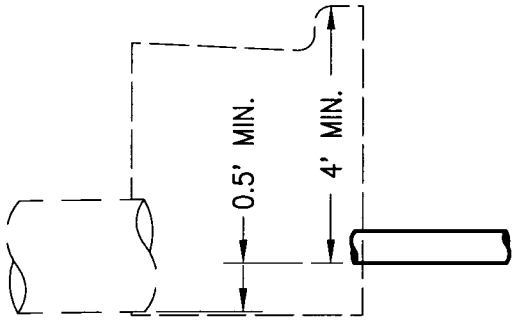
ASST. CITY ENGINEER	DIRECTOR			
SHT 1 OF 1 SHTS	DATE REVISED 4/1/04	PLATE NO. 1-06	REV. A	



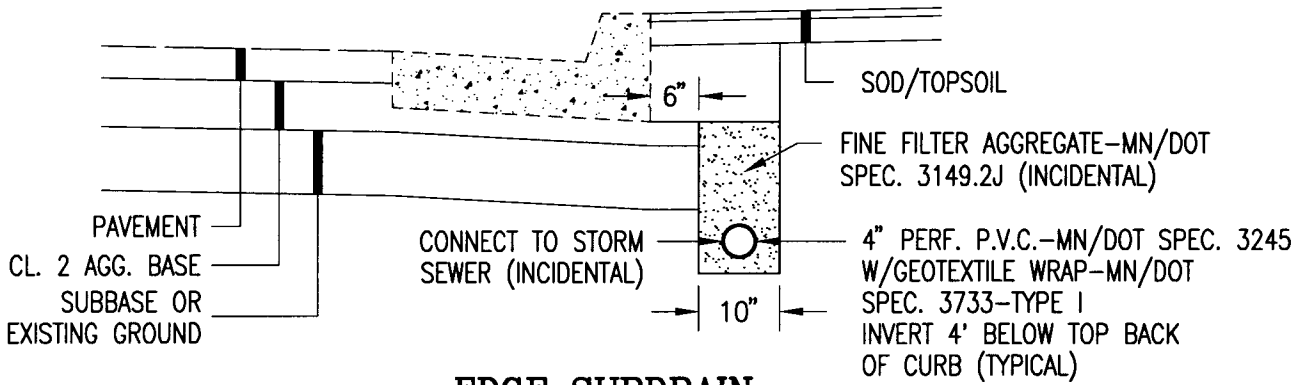
EDGE SUBDRAIN CONNECTIONS



SUBDRAIN CLEANOUT



SUBDRAIN AT STRUCTURE

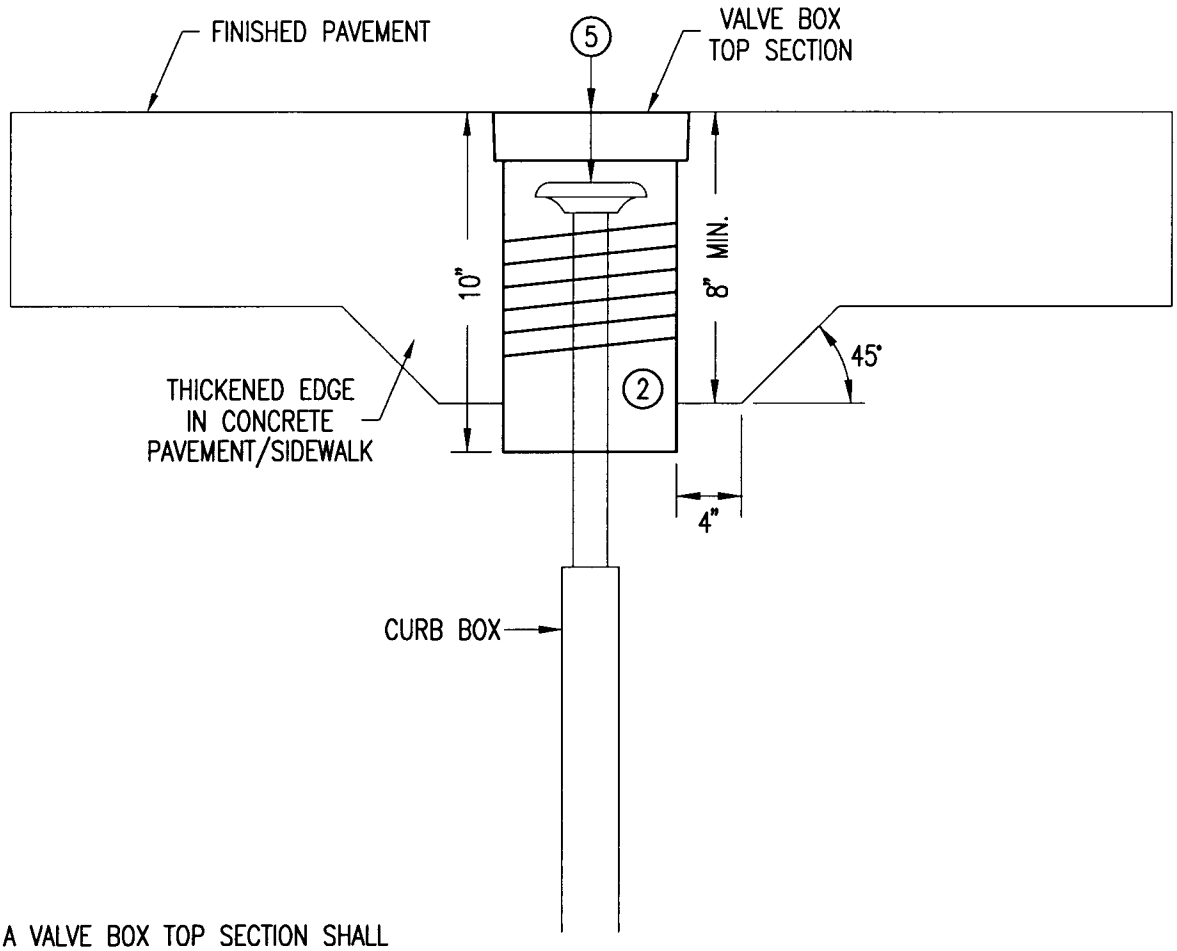


EDGE SUBDRAIN

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

SUBSURFACE DRAINS

ASST. CITY ENGINEER	DIRECTOR			
SHT 1 OF 1 SHTS	DATE REVISED 4/1/04	PLATE NO. 1-07	REV. B	



1. A VALVE BOX TOP SECTION SHALL BE USED AS A CURB BOX COVER WHENEVER THE CURB BOX FALLS INTO NEW OR REPLACED CONCRETE SIDEWALK, DRIVE APPROACH, OR BITUMINOUS PAVEMENT AREAS.

(2) VALVE BOX TOP SECTION SHALL BE OF THE SCREW TYPE, HAVE A MINIMUM INSIDE SHAFT DIAMETER OF 5 1/4", AND HAVE A CAP WITH THE WORD "WATER" PLAINLY MARKED ON TOP.

3. IN ALL RESPECTS THE VALVE BOX SHALL BE EQUAL TO TYLER/UNION-10T-UPC#144939.

4. VALVE BOX COVER SHALL BE OF THE LOCKING TYPE, EQUAL TO A TYLER/UNION UPC#145462.

(5) CURB BOX RISER CAP IS TO BE A MINIMUM OF 4" AND A MAXIMUM OF 6" BELOW THE FINISHED PAVEMENT GRADE.

6. CURB BOX RISER ADJUSTMENT, AND THE FURNISHING & INSTALLATION OF VALVE BOX TOP SECTION AND COVER, SHALL BE INCLUDED IN PAYMENT FOR CURB BOX COVER.

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

CURB BOX COVER

ASST. CITY ENGINEER	DIRECTOR			
SHT 1 OF 1 SHTS	DATE REVISED 1/1/00	PLATE NO. 1-08	REV. B	

CASTINGS – STRUCTURE TYPE 1

TYPE	DESCRIPTION	CASTING NUMBER	LID/GRATE	REMARKS
A	2' CURB INLET FRAME GRATE & BOX	R-3010	TYPE R-DIAGONAL	FOR M.H. TYPE STRUCTURE (36" DIA. BASE)
B	3' CURB INLET FRAME GRATE & BOX	R-3067-7002	TYPE R-DIAGONAL	FISH LOGO-3779
C	3' DRIVEWAY CURB INLET FRAME	R-3290-A	TYPE C	USE WHERE DRIVEWAY PRECLUDES USE OF TYPE B IN B. CURB
D	3' DRIVEOVER CURB INLET FRAME & GRATE	R-3510	TYPE C	USE WHERE DRIVEWAY PRECLUDES USE OF TYPE B IN D.O. CURB
V	3' CURB INLET FRAME GRATE & BOX	R-3067-7002	TYPE V	USE WHEN STREET GRADE EXCEEDS 2% FISH LOGO-3779

CASTINGS – OTHER STRUCTURES

	TYPE	DESCRIPTION	CASTING NUMBER	LID/GRATE	REMARKS
LIDS	1	9" FRAME AND COVER NON-ROCKING	R-1710	TYPE B LID	W/2 CONCEALED PICKHOLES
LIDS	2	9" FRAME & COVER	R-1916-C	SELF-SEALING BOLTED LID	TO BE USED IN FLOOD PRONE OR OFF STREET AREAS & IN CONCRETE PAVING
LIDS	3	6 1/2" FRAME & COVER NON-ROCKING	R-1700-A	TYPE B LID	NOT FOR USE ON NEW CONSTRUCTION, W/2 CONCEALED PICKHOLES
LIDS	3A	7" FRAME AND COVER NON-ROCKING	R-1740-B	TYPE B LID	TO BE USED FOR P.R.V. MANHOLES
GRATES	4	9" FRAME AND GRATE NON-ROCKING	R-2090	TYPE A GRATE	PAVEMENT DRAIN
GRATES	5	9" BEEHIVE FRAME	R-2560-D3	7" GRATE BEEHIVE	USE ONLY WHEN TYPES 6 OR 7 CANNOT BE USED
GRATES	6	DITCH GRATE-STOOL TYPE	R-4341-A	STOOL GRATE	HEAVY DUTY
GRATES	7	DITCH GRATE-STOOL TYPE	R-4342	STOOL GRATE	LIGHT DUTY
GRATES	8	POND SKIMMER GRATE	*	1/2" STEEL PLATE	HOT DIPPED GALVINIZED

ALL CASTING NUMBERS SHOWN ARE NEENAH FOUNDRY CATALOG NUMBERS. APPROVED EQUAL MAY BE SUBSTITUTED.

* HAALA INDUSTRIES CASTING, OR AN APPROVED EQUAL MAY BE SUBSTITUTED.

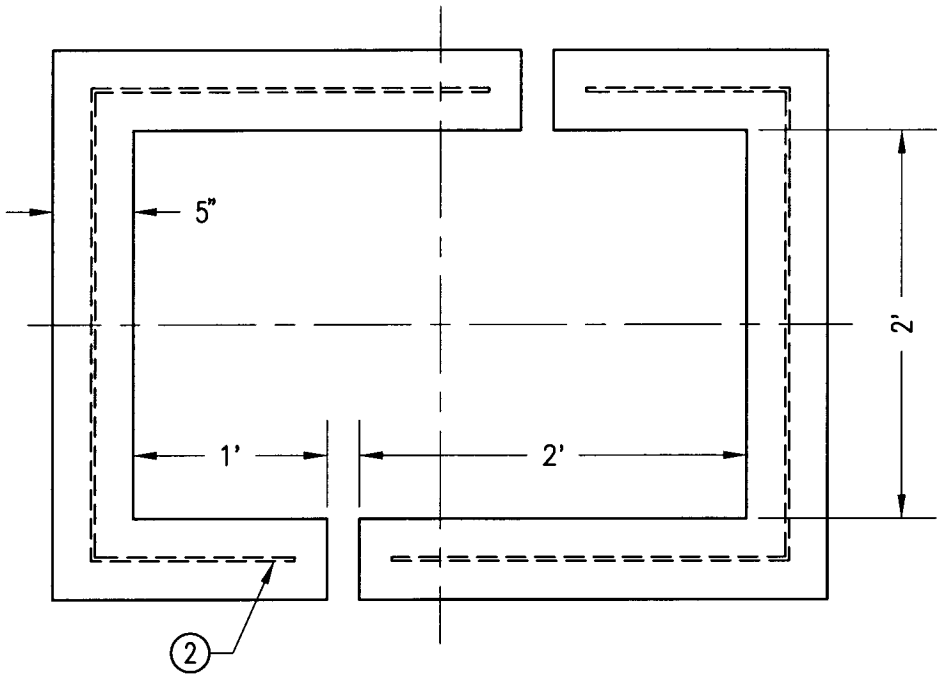
DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

CASTING SCHEDULE

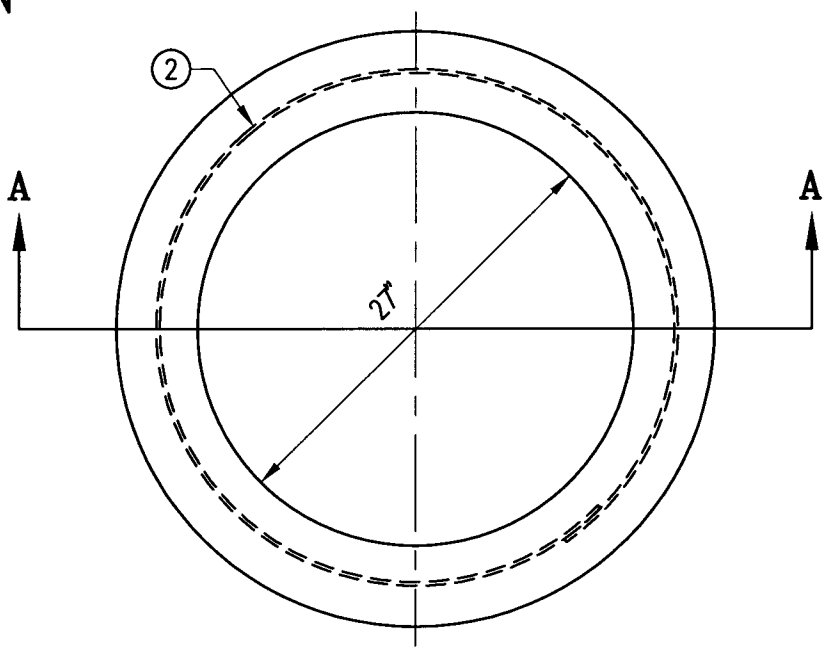
Douglas L. Nelson
ASST. CITY ENGINEER

Russell W. Fries
DIRECTOR

SHT 1 OF 1 SHTS	DATE REVISED 4/1/04	PLATE NO. 1-09	REV. G



PLAN



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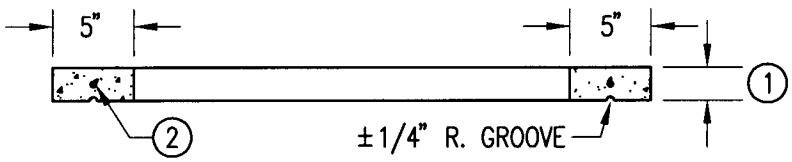


SECTION A–A

NOTES

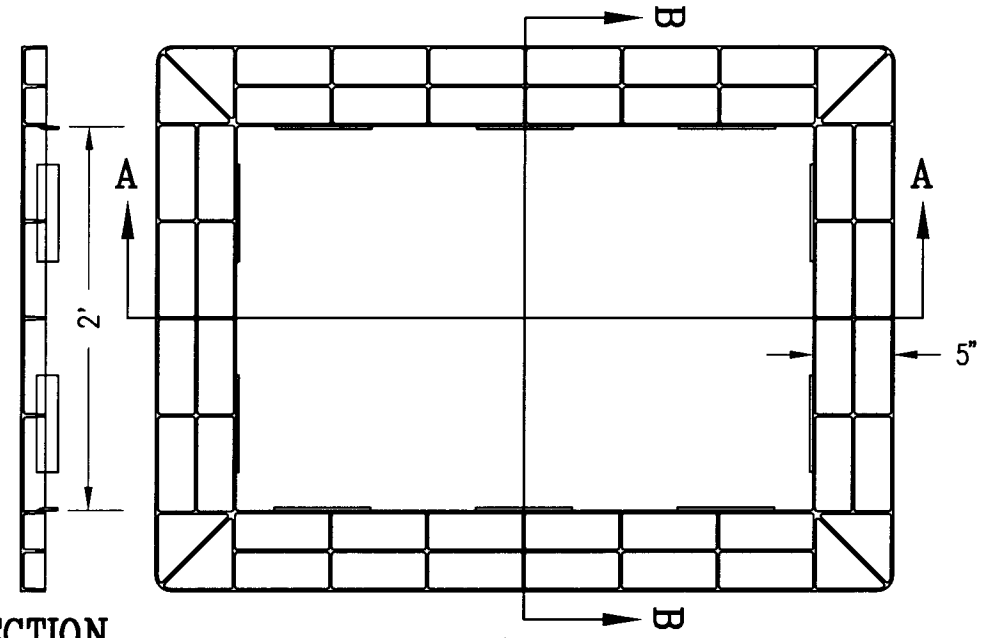
(1) VARIABLE THICKNESS OF 2" MIN. AND 6" MAX.

(2) REINFORCEMENT SHALL BE A SINGLE HOOP OF #8 GAGE STEEL WIRE

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

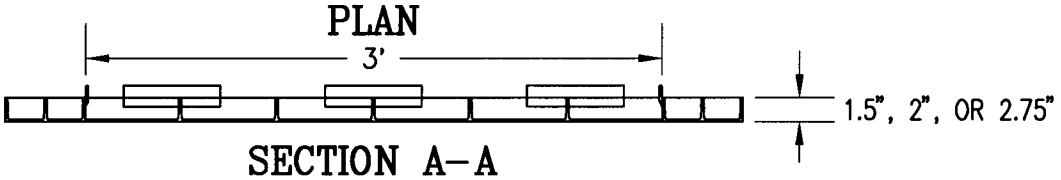
CONCRETE STRUCTURE ADJUSTING RINGS

ASST. CITY ENGINEER	DIRECTOR		
SHT 1 OF 3 SHTS	DATE REVISED 8/15/02	PLATE NO. 1–10	REV. C

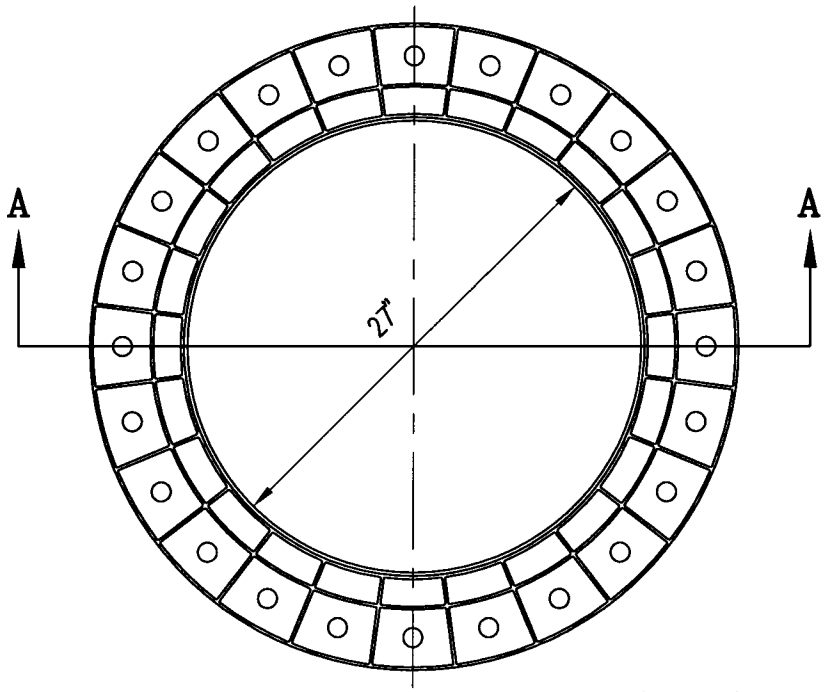


SECTION B–B

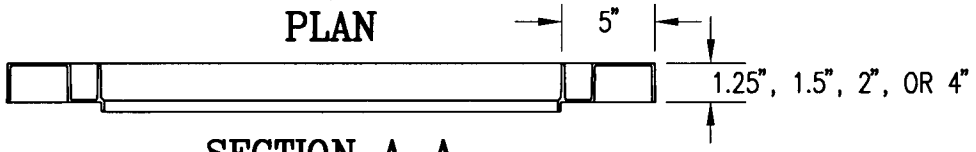
PLAN



SECTION A–A



PLAN



SECTION A–A

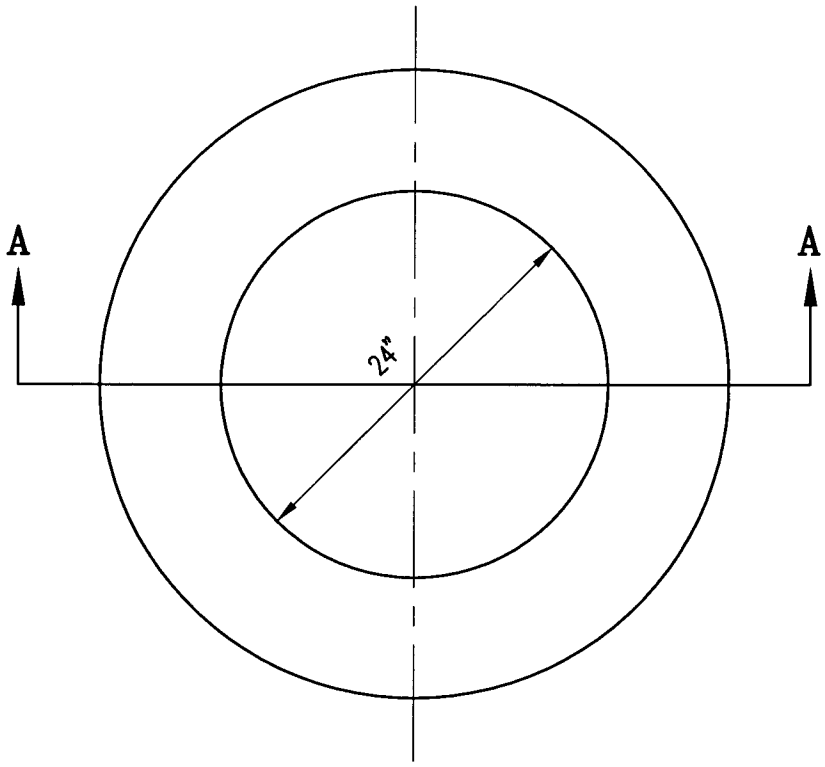
NOTES

(1) SLEEVE SHALL BE MOLDED FROM HIGH DENSITY POLYETHYLENE MATERIAL AS DEFINED IN ASTM D1248.

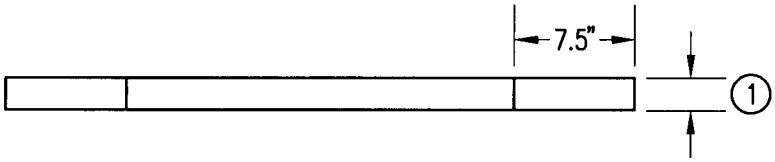
DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

POLYETHYLENE STRUCTURE ADJUSTING RINGS

ASST. CITY ENGINEER	DIRECTOR			
SHT 2 OF 3 SHTS	DATE REVISED 8/15/02	PLATE NO. 1–10	REV. A	



PLAN



SECTION A–A

NOTES

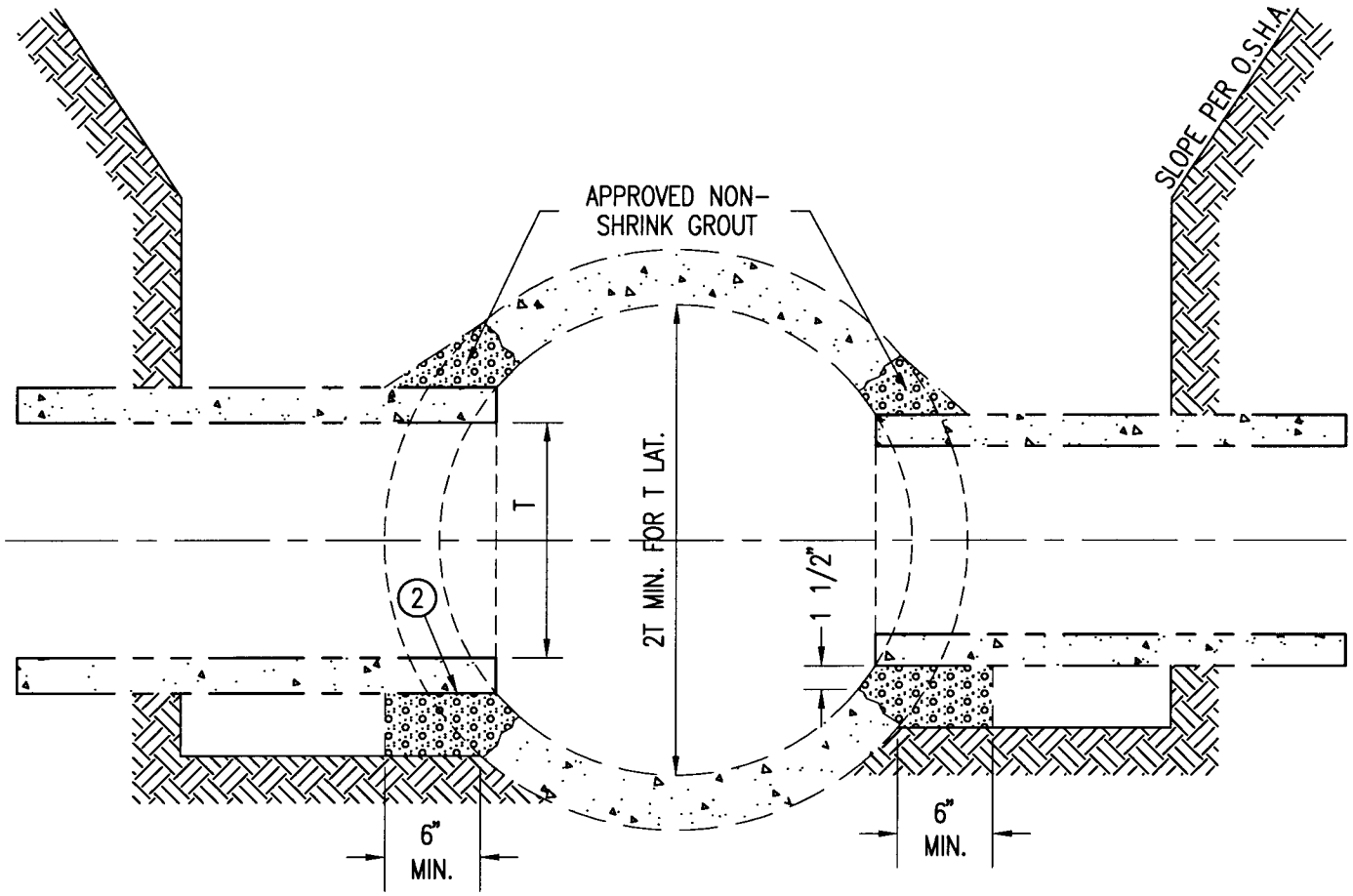
(1) VARIABLE THICKNESS OF 1/2" TO 3" IN INCREMENTS OF 1/2".

2. MATERIAL SHALL MEET ASTM 642–90 FOR DENSITY.

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

RUBBER STRUCTURE ADJUSTING RINGS

ASST. CITY ENGINEER	DIRECTOR		
SHT 3 OF 3 SHTS	DATE REVISED 8/15/02	PLATE NO. 1–10	REV. A



NOTES

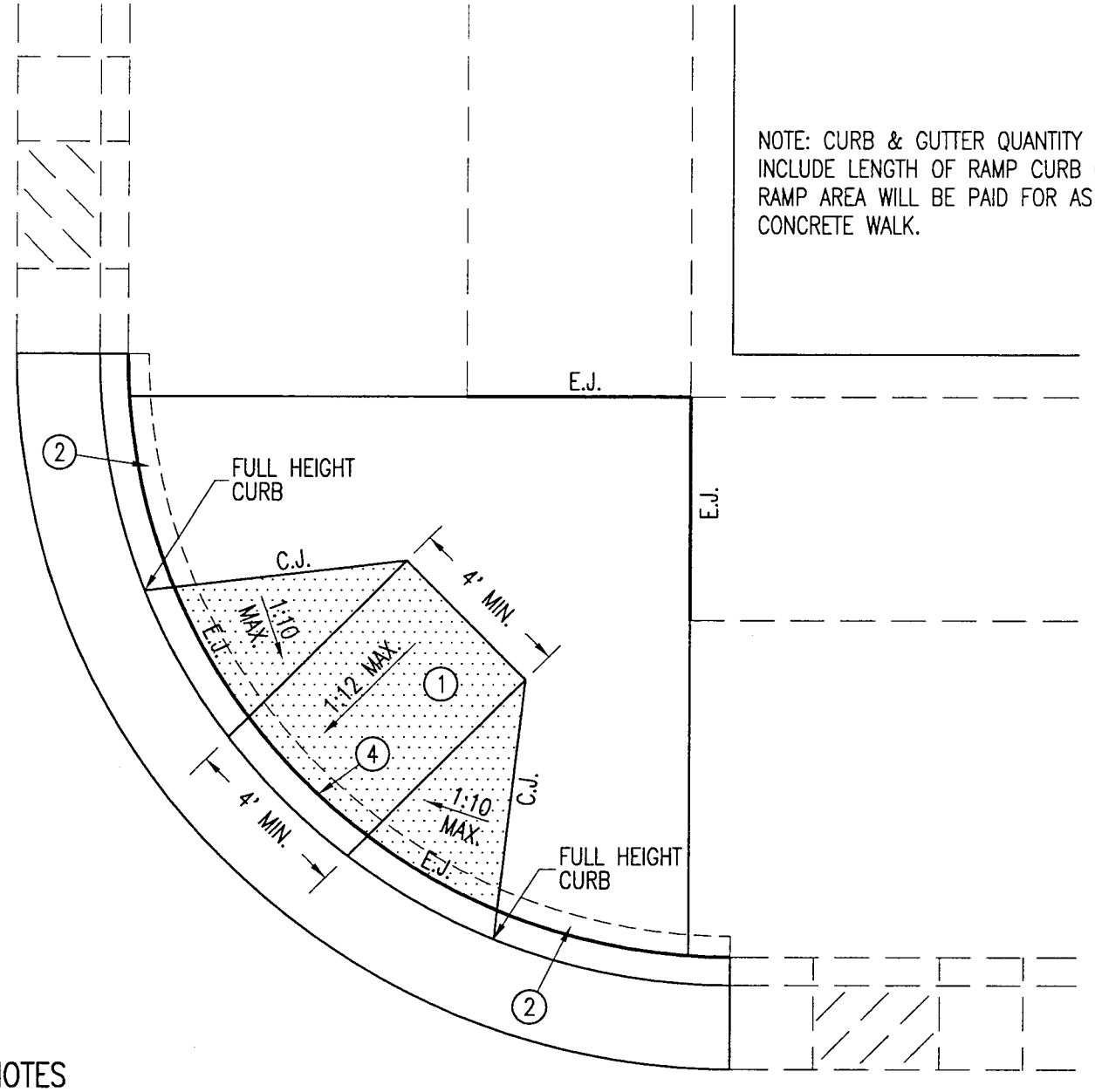
1. MANHOLE REQUIRED WHERE LATERAL PIPE OR CONNECTING PIPE EXCEEDS 1/2 MAIN PIPE DIAMETER.

(2) LATERAL PIPE SHALL NOT EXTEND INTO THE CROSS SECTION OF MAIN PIPE BEYOND THAT REQUIRED FOR FULL WALL SUPPORT.

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

BLIND–TIE FIELD CONNECTION FOR R.C.P. STORM SEWER

ASST. CITY ENGINEER	DIRECTOR			
SHT 1 OF 1 SHTS	DATE REVISED 1/1/00	PLATE NO. 1–11	REV. B	



NOTES

(1) THE FINISHED RAMP SURFACE SHALL HAVE AN EXPOSED AGGREGATE TEXTURE OBTAINED BY THE WASHING METHOD. MN/DOT SPEC. CONCRETE MIX 3A36EX SHALL BE USED IN AREAS WHERE EXPOSED AGGREGATE TEXTURE IS REQUIRED. COURSE AGGREGATE SHALL MEET MN/DOT SPEC. 3137 CA-50 GRADATION. SEEDING AND ADHESION OR SAND BLASTING IS NOT ALLOWED.

(2) SEE S.D.P. 2-02 FOR SILL & JOINT DETAIL.

3. C.J. = CONTRACTION JOINT
   E.J. = 1/2" PREFORMED JOINT FILLER PER MN/DOT SPEC. 3702.

(4) STREET GUTTER SLOPE SHALL BE 1% MIN. AND 2% MAX. AT THE RAMP BASE.

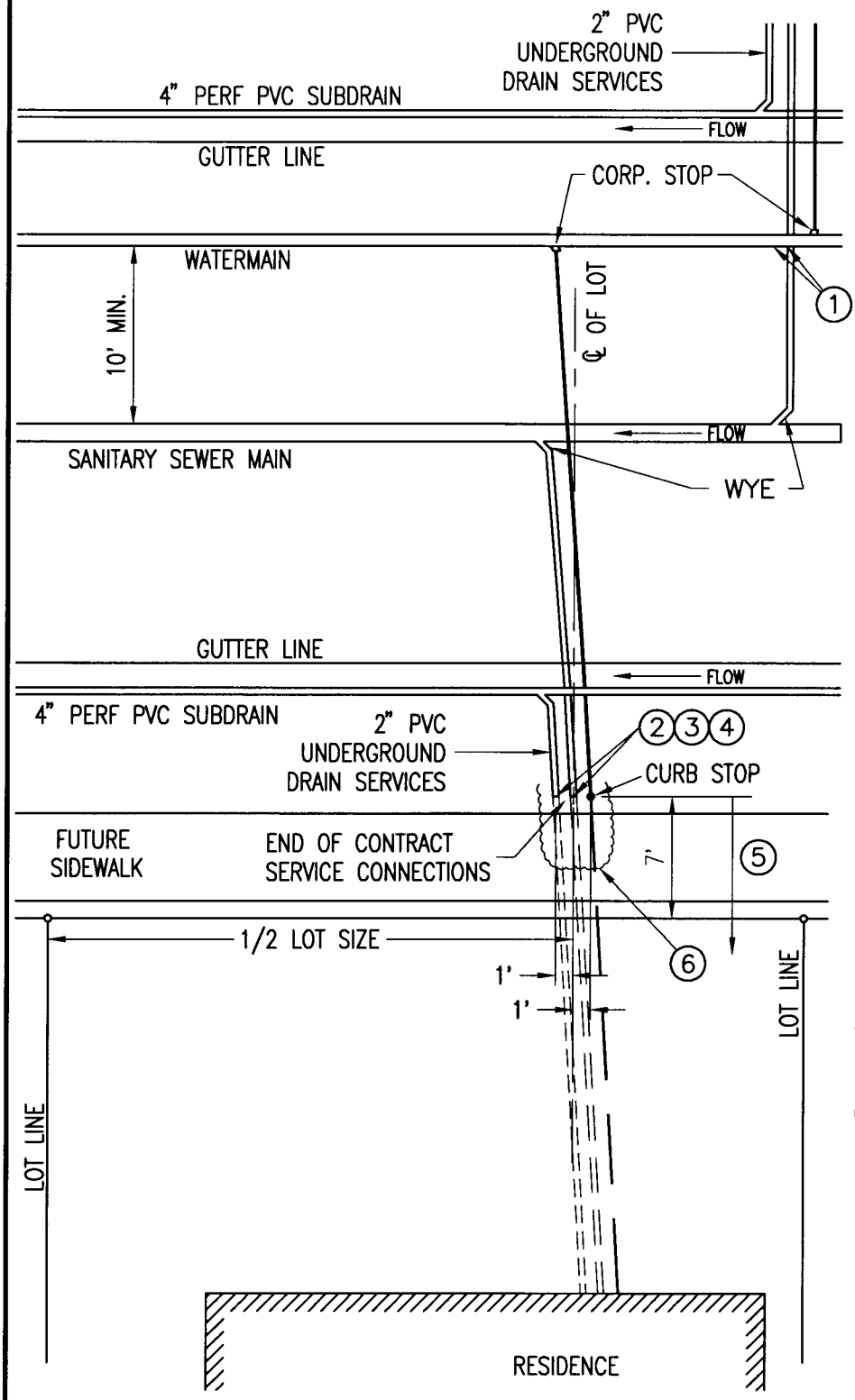
5. CONSTRUCTION JOINTS SHALL BE ALLOWED ONLY AT EXPANSION JOINTS.

6. RAMP THICKNESS IS TO BE THE SAME AS THE ABUTTING SIDEWALK.

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

PEDESTRIAN CURB RAMP

ASST. CITY ENGINEER	DIRECTOR			
SHT 1 OF 2 SHTS	DATE REVISED 4/1/04	PLATE NO. 2-12	REV. G	



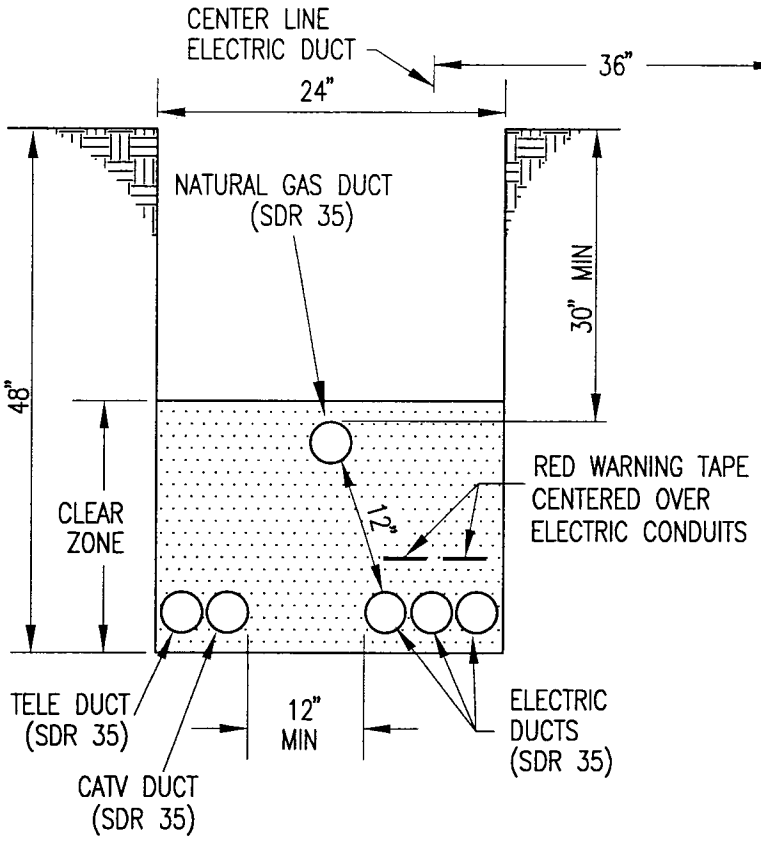
NOTES

1. SEWER SERVICE CONNECTIONS ON SAME SIDE AS WATERMAIN SHOULD BE PLACED BELOW WATERMAIN.
2. FINAL RECORD OF SERVICE LOCATIONS: END OF SEWER, WATER & SUBDRAIN SERVICES IN BLVD. SHALL BE REFERRED TO LOT CORNER AND PROPERTY LINE. SHOW ELEV. OF SEWER AND UNDERGROUND SERVICES AND DISTANCE FROM LOT CORNER TO SEWER SERVICE. ALSO SHOW DIM. BETWEEN END OF SEWER SERVICE AND ENDS OF WATER AND UNDERGROUND DRAIN SERVICE.
3. TO DETERMINE ELEVATION OF END OF SEWER SERVICE: USING TOP OF INSIDE OF MAIN AT WYE, BEGIN 2% GRADE (APPROX. 1/4" PER FT.) IF DEPTH OF INVERT AT END OF SERVICE IS GREATER THAN 8.5' BELOW FINISH BOULEVARD GRADE, INCREASE GRADIENT. FINAL DEPTH OF SEWER SERVICE LESS THAN 8' BELOW FINISH BOULEVARD GRADE SHALL BE REVIEWED AND APPROVED BY CITY ENGINEER.
4. PLUG END OF SANITARY SEWER AND UNDERGROUND SERVICES. PLACE 4"x4" WOOD POST, EXTENDING ONE FOOT ABOVE GRADE, AT END OF SANITARY SERVICE IF IN A DIFFERENT LOCATION THAN THE CURB STOP.
5. FUTURE EXTENSION OF SERVICES BY OTHERS
6. WHEN INSTALLED IN SOLID ROCK, BLAST 4' BEYOND END OF PIPE FOR FUTURE CONNECTION.
7. REFER TO S.D.P. 6-11 FOR ADDITIONAL WATER SERVICE DETAIL
8. REFER TO S.D.P. 1-07 FOR ADDITIONAL SUBDRAIN DETAIL

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

SERVICE CONNECTIONS STUBBED INTO BOULEVARD

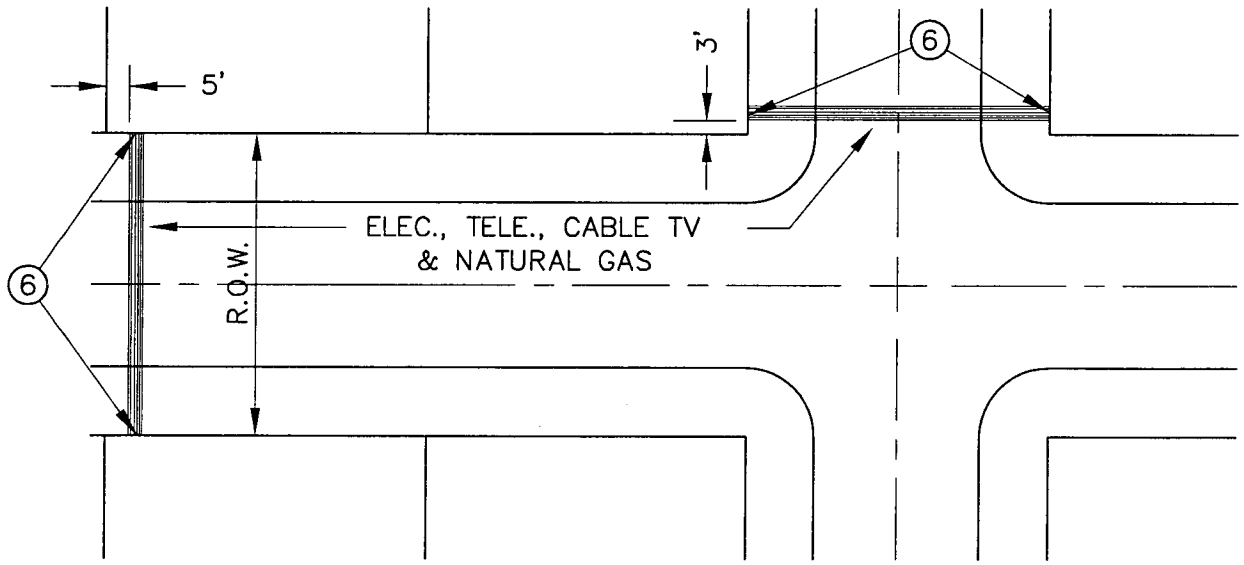
ASST. CITY ENGINEER	DIRECTOR			
SHT 1 OF 1 SHTS	DATE REVISED 4/1/04	PLATE NO. 4-01	REV. D	



NOTES

1. CLEAR ZONE SHALL NOT CONTAIN BACKFILL GRANULAR MATERIAL LARGER THAN 1/4" IN DIAMETER.
2. TRENCH BED SHALL BE OF A SMOOTH, UNIFORM GRADE, COMPACTED, AND FREE OF STONES OR PROTRUSIONS LARGER THAN 1/4". UNSUITABLE TRENCH BEDS SHALL RECEIVE A 2" COMPACTED LAYER OF "CLEAR ZONE" BACKFILL PRIOR TO CONDUIT PLACEMENT.
3. ELECTRIC DUCT TO BE NEAREST DUCT TO PROPERTY LINE.
4. CONDUIT END CAP COLORS ARE:
   RPU–RED
   CABLE TV–PINK
   NW BELL TELE–BLAZE ORANGE
   NATURAL GAS–YELLOW
5. CONDUIT NEEDING SURFACE ACCESS SHALL BE DONE SO BY USING LONG SWEEP BENDS.

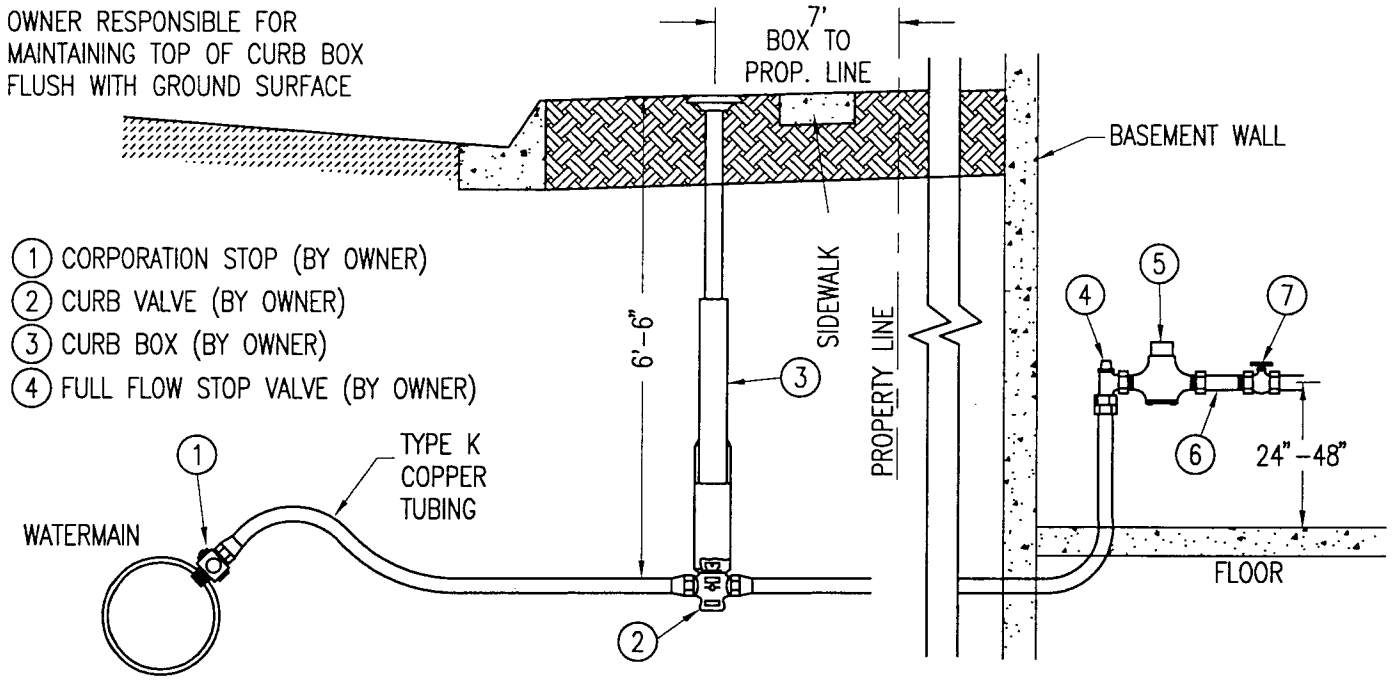
(6) A 4"x4" WOODEN POST, EXTENDING ONE FOOT ABOVE GRADE, SHALL BE PLACED BY THE UTILITY CROSSING CONDUITS TO MARK THEIR LOCATION.



DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

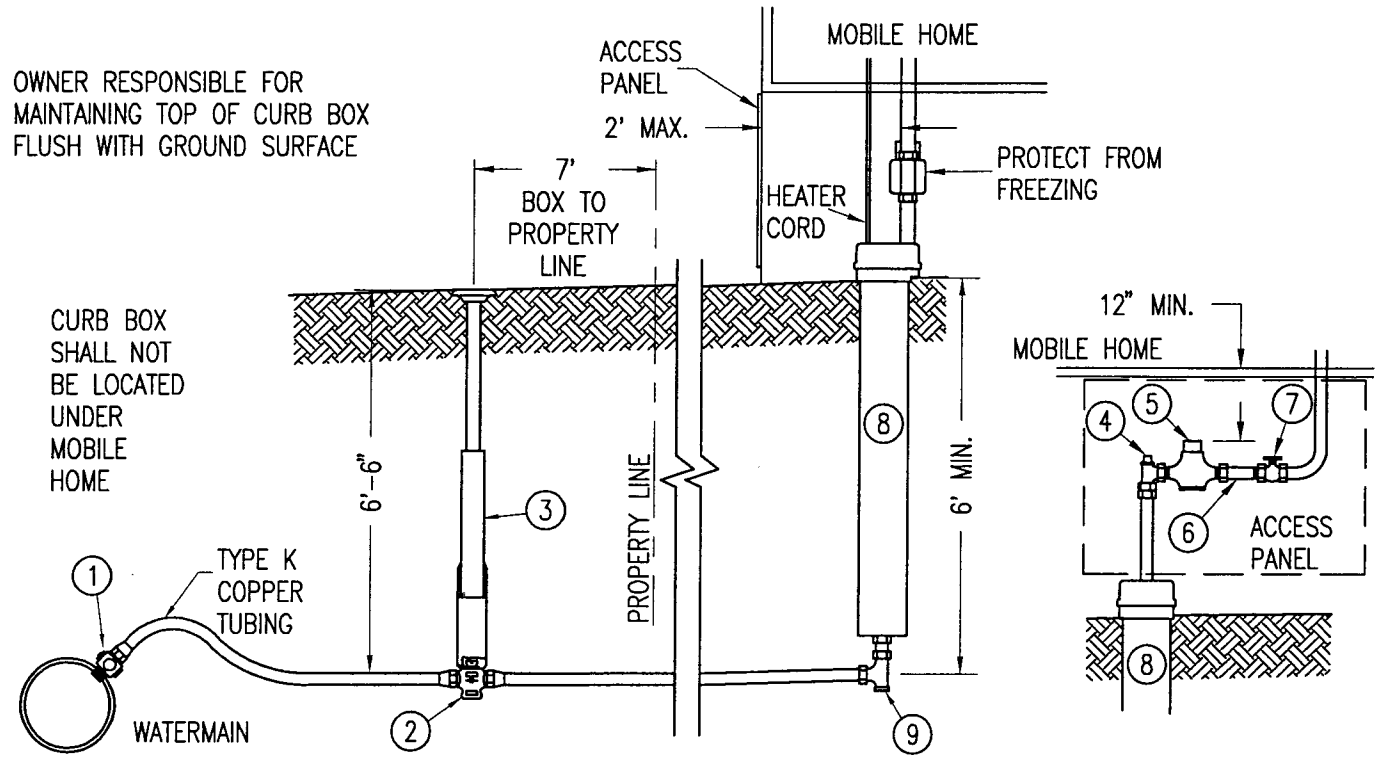
STREET CROSSINGS FOR UTILITY CONDUITS

ASST. CITY ENGINEER	DIRECTOR			
SHT 1 OF 1 SHTS	DATE REVISED 4/1/04	PLATE NO. 4–03	REV. B	



(1) CORPORATION STOP (BY OWNER)
(2) CURB VALVE (BY OWNER)
(3) CURB BOX (BY OWNER)
(4) FULL FLOW STOP VALVE (BY OWNER)
(5) METER (BY RPU)
(6) METER TAILS (BY RPU)
(7) FULL FLOW STOP VALVE (BY OWNER)

TYPICAL RESIDENTIAL DETAILS



(1) 1" CORPORATION STOP (BY OWNER)
(2) 1" CURB VALVE (BY OWNER)
(3) CURB BOX TAPPED 1 1/2" OR 2" (BY OWNER)
(4) FULL FLOW STOP VALVE (BY OWNER)
(5) WATER METER (BY RPU)
(6) METER TAILS (BY RPU)
(7) FULL FLOW STOP VALVE (BY OWNER)
(8) WOOD "THERMALINE" HYDRANT OR EQUAL
(9) 3/4" M.I.P. X 3/4" M.I.P. X 1" (BY OWNER)

TYPICAL MANUFACTURED HOME DETAILS

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

WATER SERVICE AND METER SETTING DETAILS

Douglas C. Rovang
RPU—WATER UTILITY

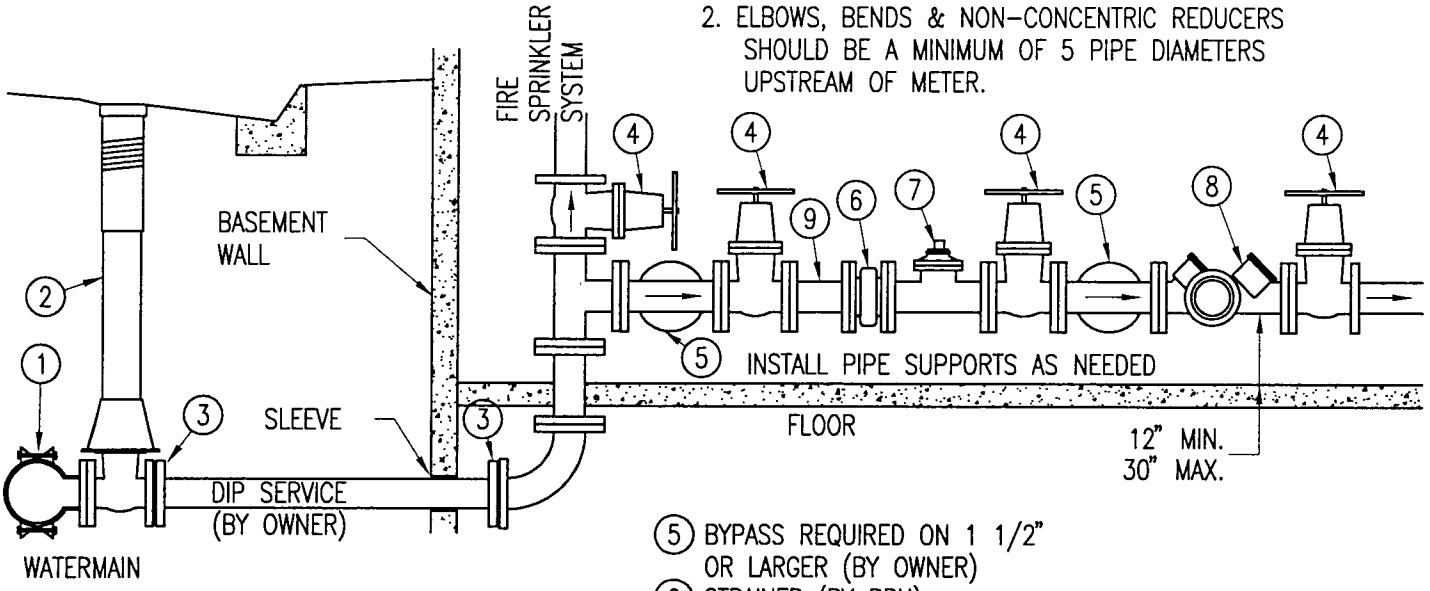
Russell W. Fries
DIRECTOR

SHT 1 OF 2 SHTS	DATE REVISED	PLATE NO.	REV.
	4/1/04	6-11	C

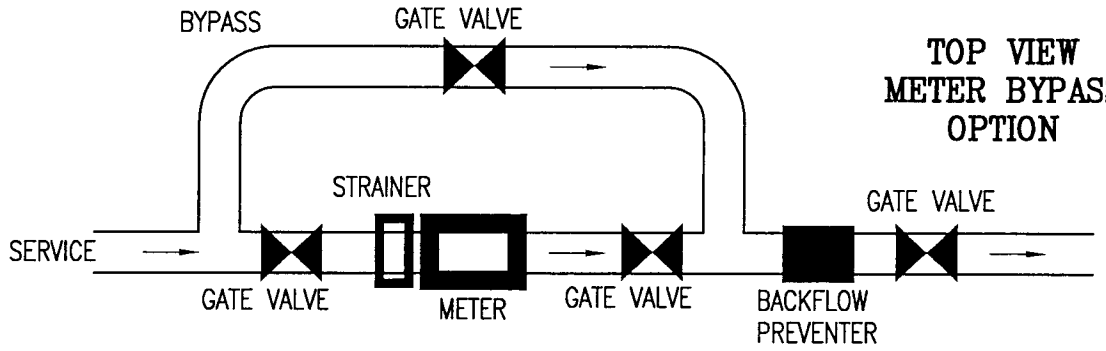
OWNER RESPONSIBLE FOR MAINTAINING TOP OF VALVE BOX FLUSH WITH STREET SURFACE

NOTES

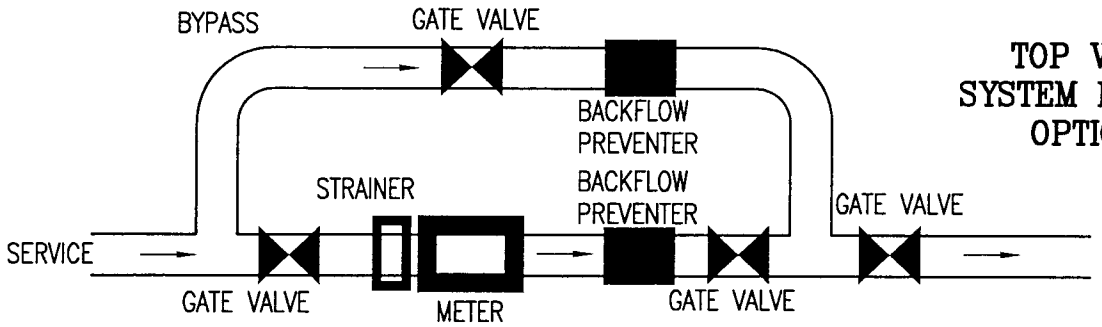
1. DO NOT INSTALL CHECK VALVES OR PRESSURE REDUCING DEVICES UPSTREAM AND LESS THAN 5 PIPE DIAMETERS DOWNSTREAM OF THE METER.
2. ELBOWS, BENDS & NON-CONCENTRIC REDUCERS SHOULD BE A MINIMUM OF 5 PIPE DIAMETERS UPSTREAM OF METER.



(1) TAPPING SLEEVE & VALVE OR CUT-IN-TEE & VALVE (BY OWNER)
(2) VALVE BOX (BY OWNER)
(3) RETAINER GLAND (BY OWNER)
(4) FULL FLOW VALVE (BY OWNER)
(5) BYPASS REQUIRED ON 1 1/2" OR LARGER (BY OWNER)
(6) STRAINER (BY RPU)
(7) METER (BY RPU)
(8) APPROVED BACKFLOW PREVENTER (BY OWNER)
(9) MINIMUM 5 PIPE DIAMETERS UPSTREAM OF STRAINER



TOP VIEW METER BYPASS OPTION



TOP VIEW SYSTEM BYPASS OPTION

TYPICAL COMMERCIAL/ INDUSTRIAL DETAILS

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

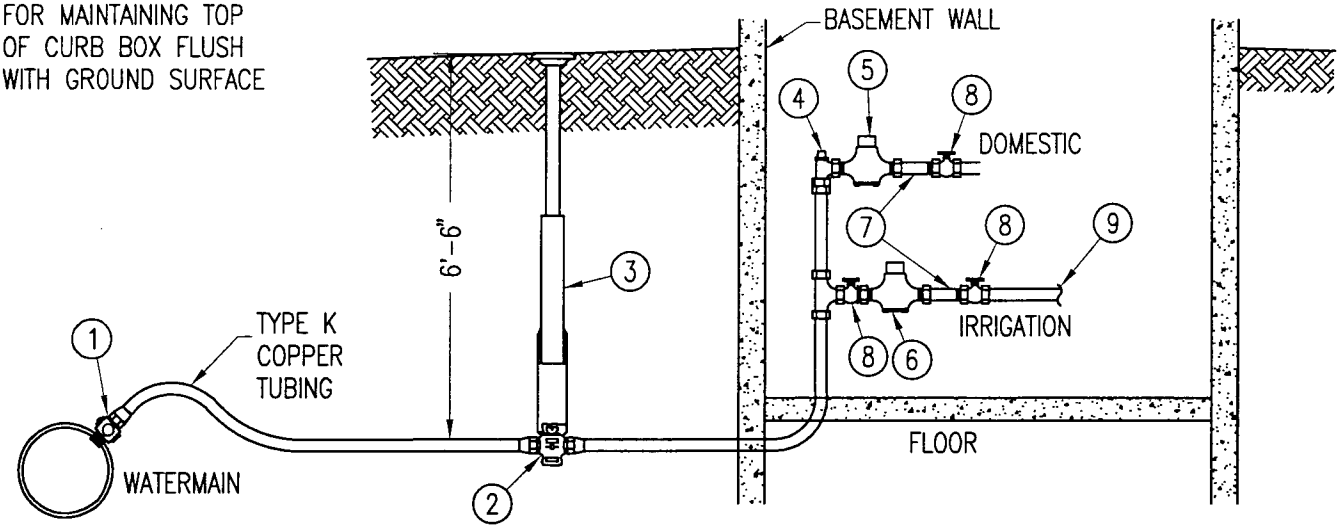
WATER SERVICE AND METER SETTING DETAILS

Douglas C. Rovang
RPU-WATER UTILITY

Russell W. Fries
DIRECTOR

SHT 2 OF 2 SHTS	DATE REVISED 4/1/04	PLATE NO. 6-11	REV. C

OWNER RESPONSIBLE FOR MAINTAINING TOP OF CURB BOX FLUSH WITH GROUND SURFACE

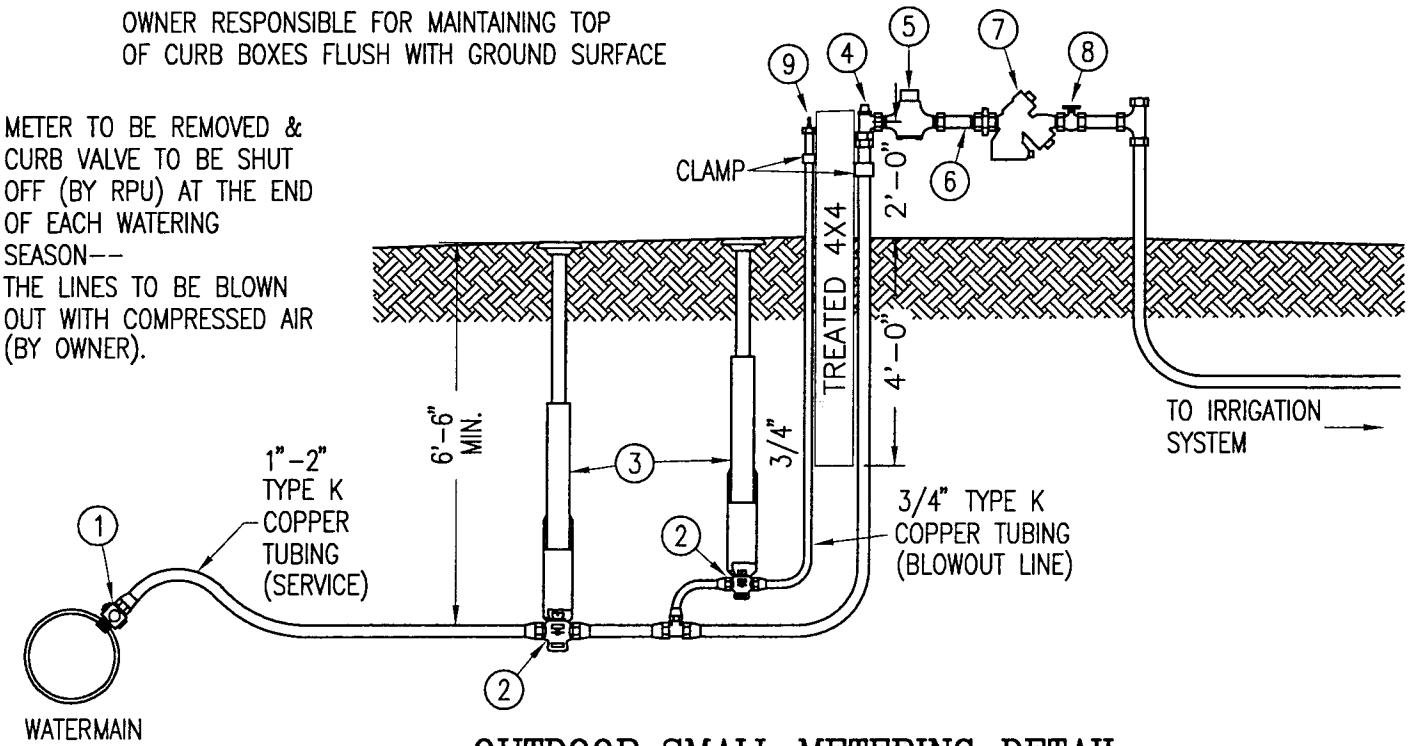


INDOOR METERING DETAIL

1. CORPORATION STOP (BY OWNER)
2. CURB VALVE (BY OWNER)
3. CURB BOX (BY OWNER)
4. FULL FLOW STOP VALVE (BY OWNER)
5. METER TO DOMESTIC SYSTEM (BY RPU)
6. METER TO IRRIGATION SYSTEM (BY RPU)
7. METER TAILS (BY RPU)
8. FULL FLOW STOP VALVE (BY OWNER)
9. APPROVED BACKFLOW PREVENTER (BY OWNER)

OWNER RESPONSIBLE FOR MAINTAINING TOP OF CURB BOXES FLUSH WITH GROUND SURFACE

METER TO BE REMOVED & CURB VALVE TO BE SHUT OFF (BY RPU) AT THE END OF EACH WATERING SEASON-- THE LINES TO BE BLOWN OUT WITH COMPRESSED AIR (BY OWNER).



OUTDOOR SMALL METERING DETAIL (SEASONAL USE ONLY)

1. CORPORATION STOP (BY OWNER)
2. CURB VALVE (BY OWNER)
3. CURB BOX (BY OWNER)
4. ANGLE STOP (BY OWNER)
5. METER (BY RPU)
6. METER TAIL (BY RPU)
7. APPROVED BACKFLOW PREVENTER (BY OWNER)
8. FULL FLOW GATE VALVE (BY OWNER)
9. AIR VALVE STEM FOR BLOWOUT (BY OWNER)

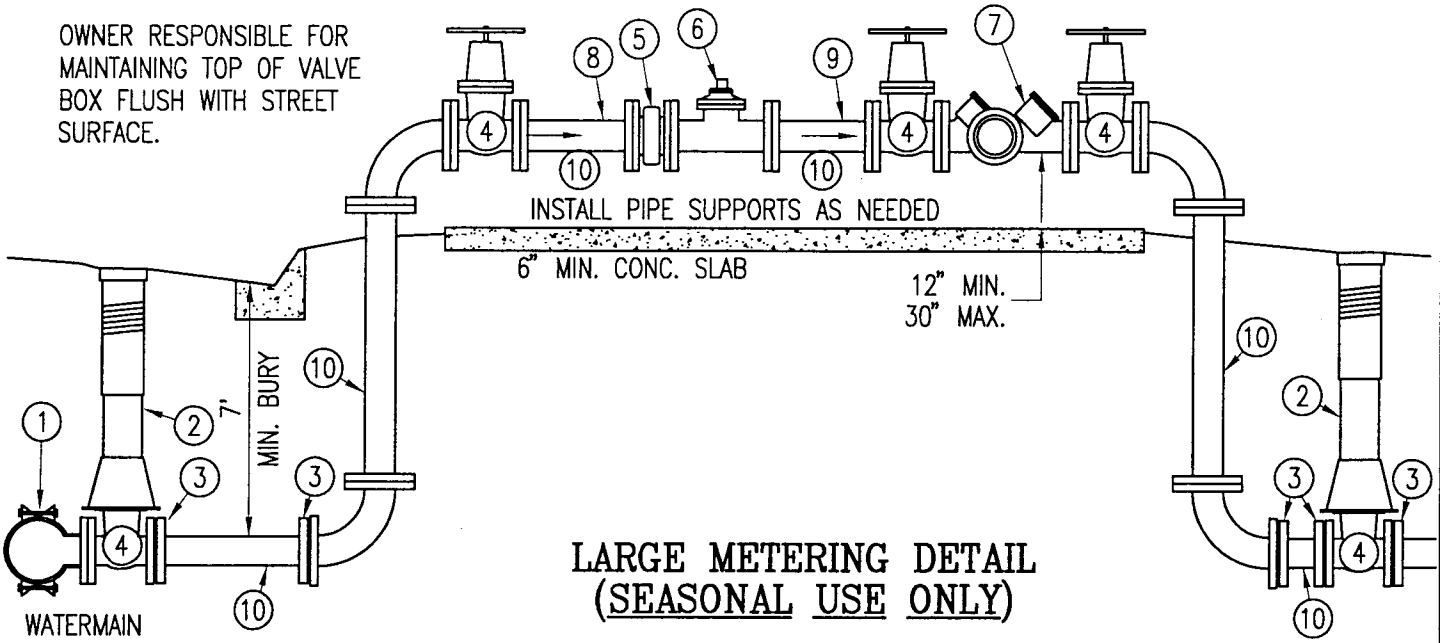
DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

IRRIGATION SYSTEM

Douglas C. Rovang — RPU-WATER UTILITY

Russell W. Fries — DIRECTOR

SHT 1 OF 2 SHTS	DATE REVISED	PLATE NO.	REV.
	4/1/04	6-12	C



LARGE METERING DETAIL (SEASONAL USE ONLY)

(1) TAPPING SLEEVE & VALVE OR CUT-IN-TEE & VALVE (BY OWNER)
(2) VALVE BOX (BY OWNER)
(3) RETAINER GLAND (BY OWNER)
(4) FULL FLOW VALVE (BY OWNER)
(5) STRAINER (BY RPU)
(6) METER (BY RPU)
(7) APPROVED BACKFLOW PREVENTER (BY OWNER)
(8) MINIMUM 5 PIPE DIAMETERS UPSTREAM OF STRAINER
(9) MINIMUM 2 PIPE DIAMETERS DOWNSTREAM OF METER
(10) DUCTILE IRON PIPE SERVICE BY OWNER

NOTES

1. DO NOT INSTALL BACK FLOW PREVENTER UPSTREAM AND LESS THAN 5 PIPE DIAMETERS DOWNSTREAM OF THE METER.
2. ELBOWS, BENDS & NON-CONCENTRIC REDUCERS SHOULD BE A MINIMUM OF 10 PIPE DIAMETERS UPSTREAM OF METER.

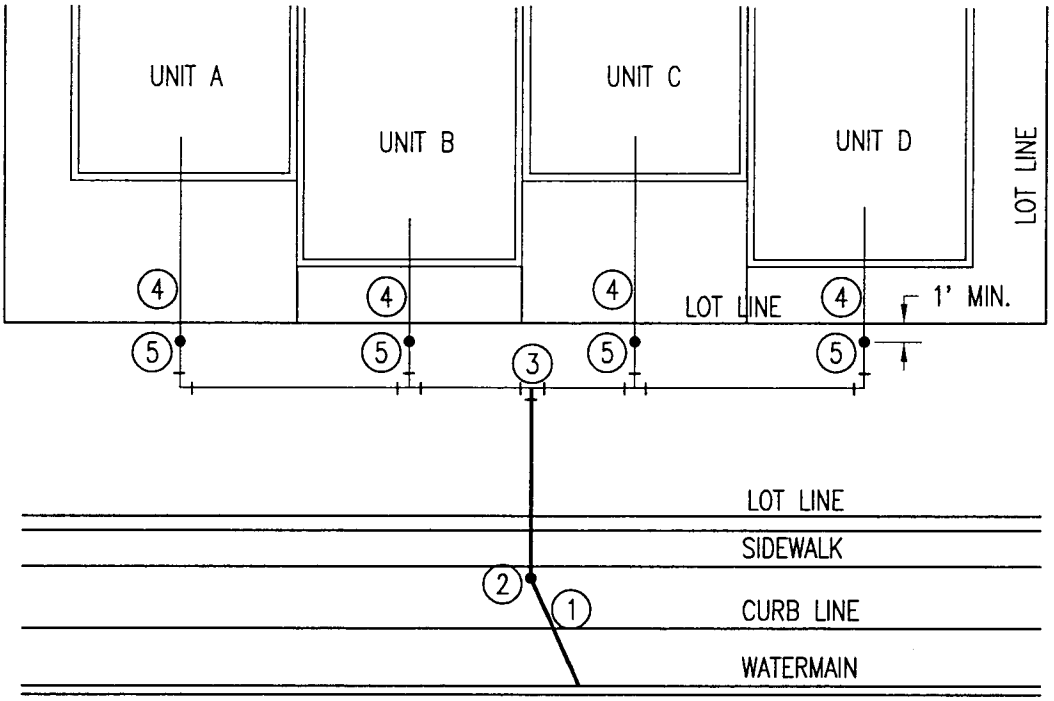
DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

IRRIGATION SYSTEM

Douglas C. Rovang
RPU-WATER UTILITY

Russell W. Fries
DIRECTOR

SHT 2 OF 2 SHTS	DATE REVISED 4/1/04	PLATE NO. 6-12	REV. C

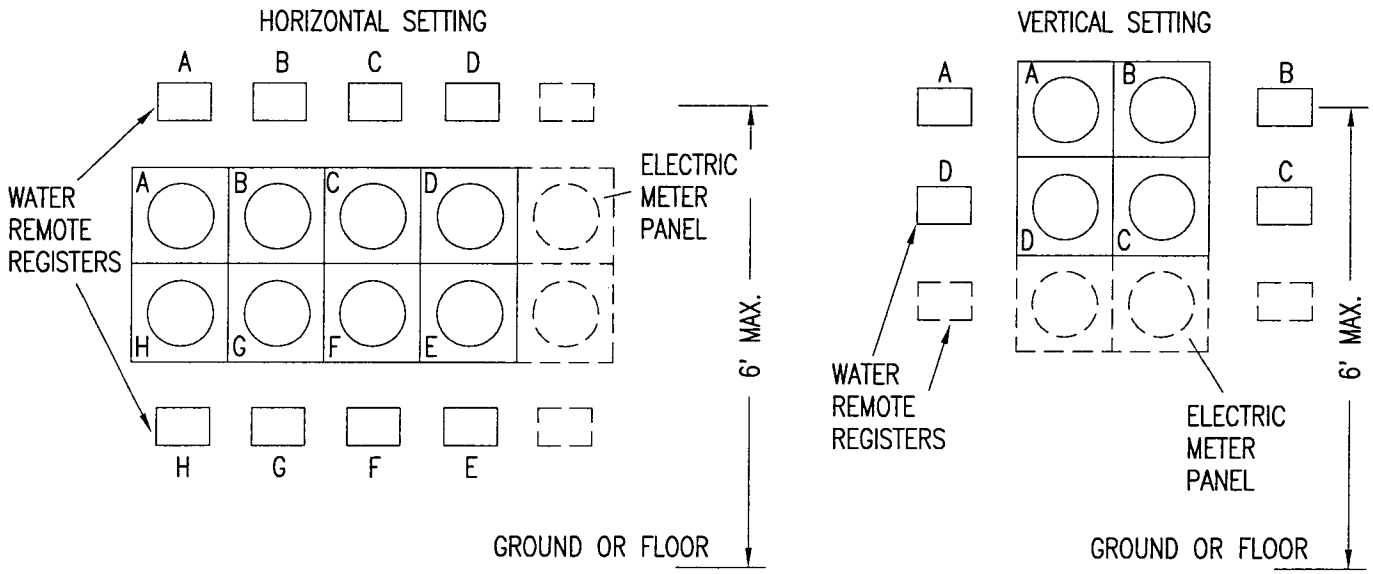


NOTE

ALL SERVICE CONNECTIONS OF THIS TYPE SHALL BE REVIEWED BY RPU FOR PROPER SIZING PRIOR TO INSTALLATION. SERVICE FROM WATERMAIN TO BUILDING BY OWNER.

1. MASTER SERVICE
2. MASTER CURB BOX
3. MASTER TEE (SPLIT FOR INDIVIDUAL UNIT SERVICES)
4. INDIVIDUAL SERVICES–MINIMUM 1"
5. INDIVIDUAL CURB BOXES

ALTERNATE SERVICE LAYOUT FOR TOWNHOUSES



TYPICAL WATER REMOTE REGISTER SETTING

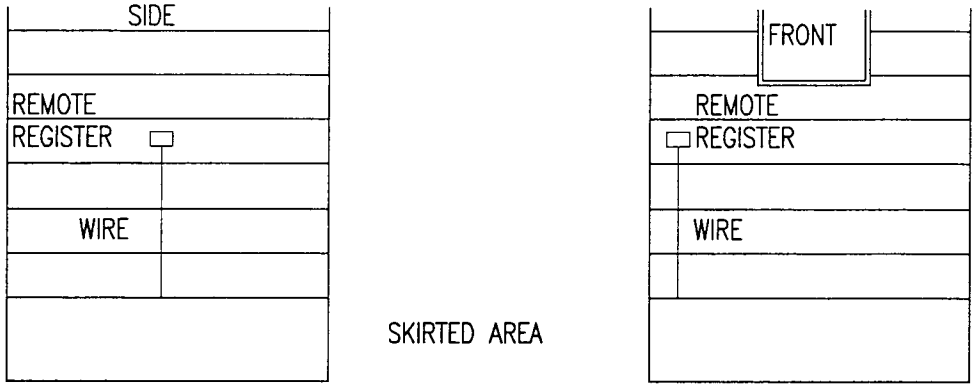
DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

WATER REMOTE REGISTER MULTIPLE DWELLING

Douglas C. Rovang
RPU–WATER UTILITY

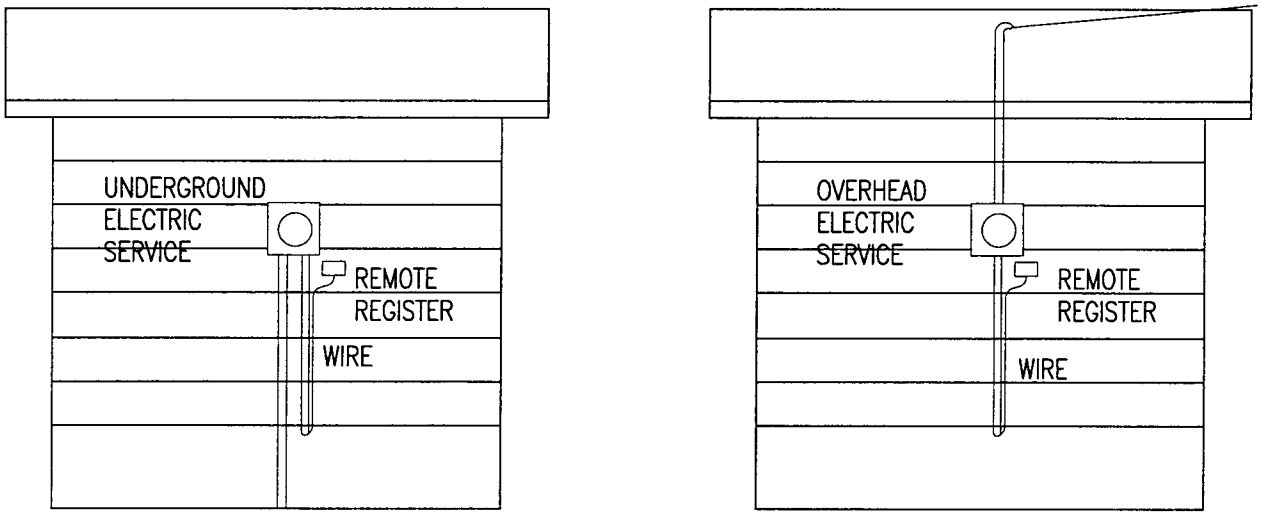
Richard W. Freese
DIRECTOR

SHT 1 OF 1 SHTS	DATE REVISED 4/1/04	PLATE NO. 6–13	REV. B



A REMOTE REGISTER FOR A MOBILE HOME SHALL BE LOCATED ON THE OUTSIDE OF THE MOBILE HOME IN SUCH A PLACE WHICH IS ACCESSIBLE TO METER READERS AT ALL TIMES. THE LOCATION OF THE REMOTE REGISTER SHALL BE ON THE OUTSIDE OF THE MOBILE HOME, APPROX. EYE LEVEL, IN AN AREA CLOSEST TO THE VICINITY OF THE ELECTRIC METER. THE REMOTE REGISTER WIRE SHALL BE RUN FROM THE WATER METER LOCATION TO THE OUTSIDE OF THE MOBILE HOME BY AN ELECTRICIAN, MOBILE HOME SETTER, OR OWNER. THE RPU SERVICE WORKER WILL THEN INSTALL THE REMOTE REGISTER AND MAKE THE CONNECTIONS.

TYPICAL MANUFACTURED HOME



AN OUTSIDE REMOTE REGISTER SHALL BE LOCATED NEXT TO THE ELECTRIC METER. NEW HOMES OR NEW REWIRE OF OLDER HOMES, THE ELECTRICIAN SHALL RUN THE WIRE FOR THE REMOTE FROM THE WATER METER IN THE BASEMENT TO THE OUTSIDE OF THE HOUSE NEXT TO THE ELECTRIC METER. THE RPU SERVICE WORKER WILL THEN INSTALL THE REGISTER AND MAKE THE CONNECTIONS.

TYPICAL RESIDENTIAL HOME

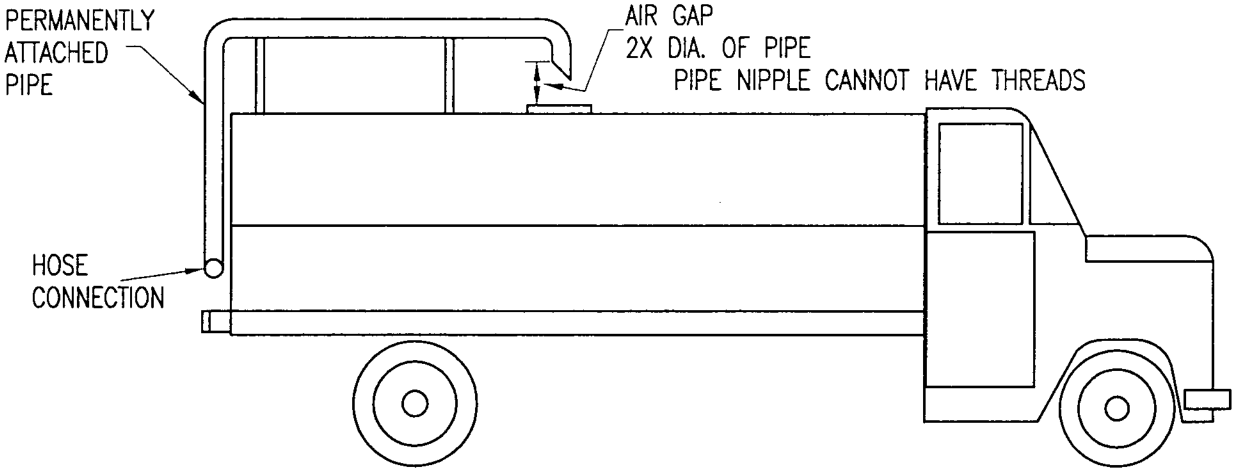
DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

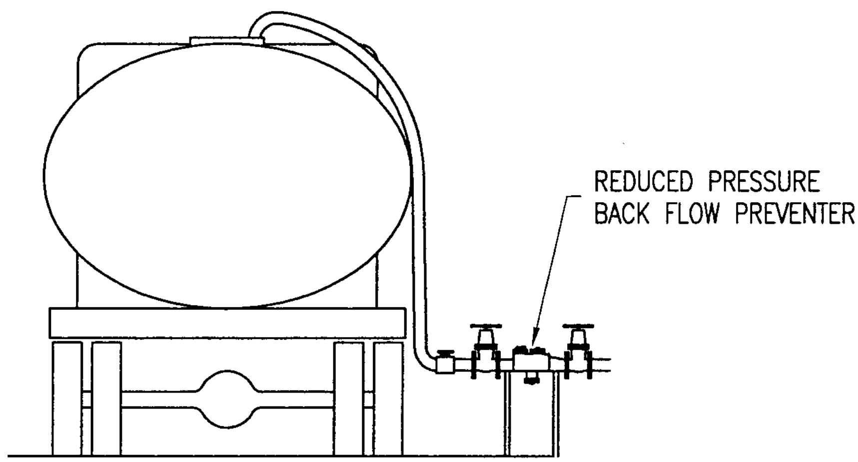
WATER REMOTE REGISTER SETTING DETAILS

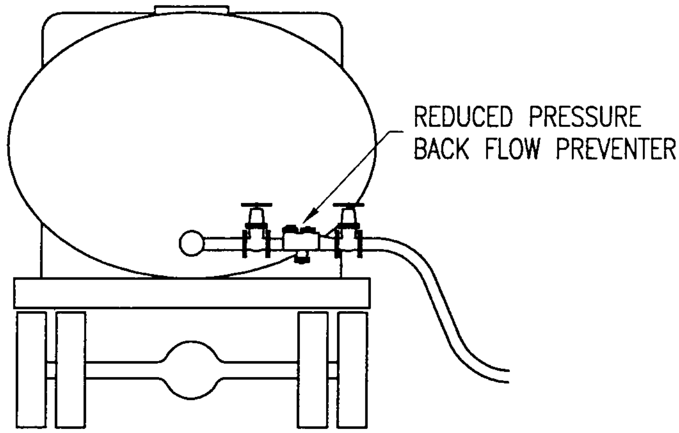
Douglas C. Rovang
RPU–WATER UTILITY

Russell W. Fries
DIRECTOR

SHT 1 OF 1 SHTS	DATE REVISED 4/1/04	PLATE NO. 6–14	REV. B







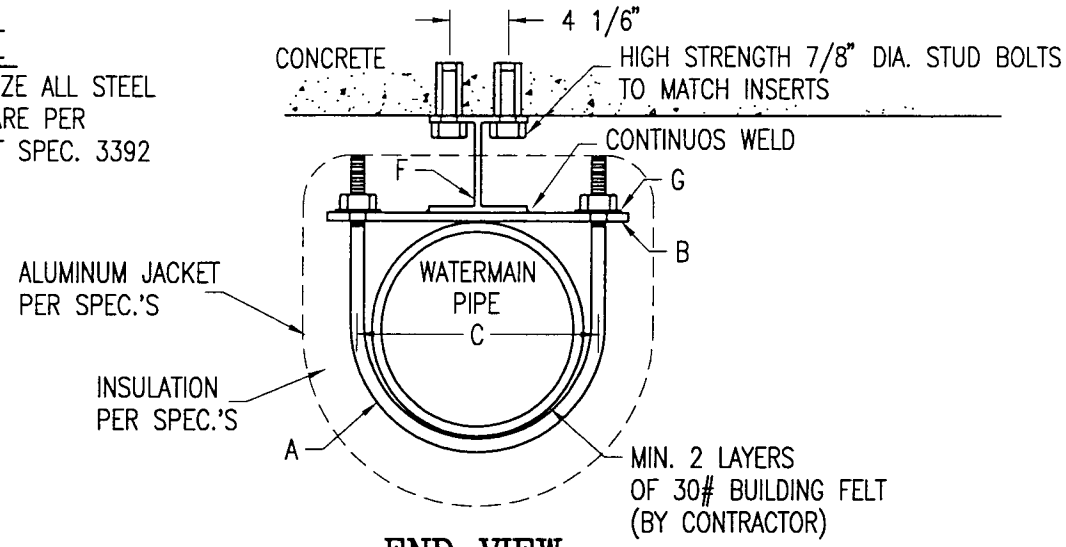
DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

BACKFLOW PREVENTION FOR WATER TANKERS

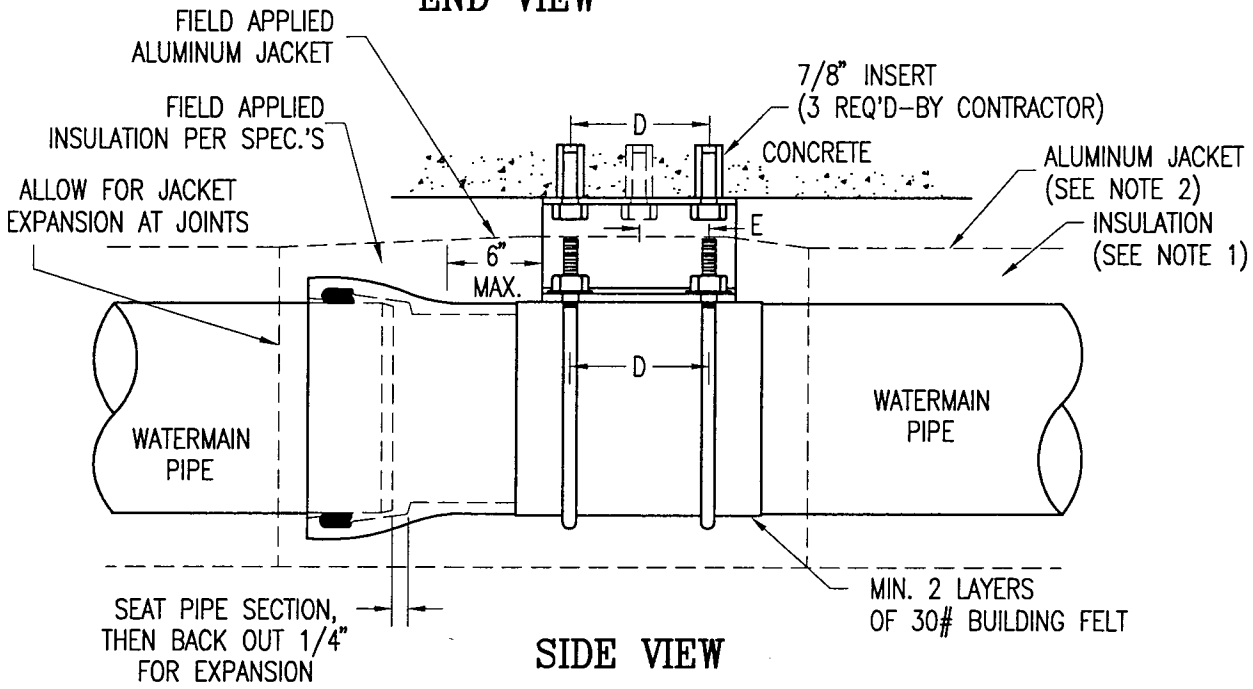
RPU-WATER UTILITY	DIRECTOR		
SHT 1 OF 1 SHTS	DATE REVISED 4/1/04	PLATE NO. 6-15	REV. B

NOTE

GALVANIZE ALL STEEL HARDWARE PER MN/DOT SPEC. 3392



END VIEW



SIDE VIEW

	8" WATERMAIN	12" WATERMAIN
A	3/4" x 10" STD. U-BOLT	7/8" x 14" STD. U-BOLT
B	15" x 12" x 1/2" STEEL PLATE	18" x 12" x 1/2" STEEL PLATE
	W/ 4-7/8" HOLES	W/ 4- 1" HOLES
C	11 5/8"	15"
D	9"	9"
E	4 1/2"	4 1/2"
F	W6 x 25 STEEL I-BEAM W/ 3-1" HOLES	W6 x 25 STEEL I-BEAM W/ 3-1" HOLES
G	DOUBLE 1/4" x 3/4" WASHERS (8 TOTAL)	1/4" x 3/4" WASHERS (4 TOTAL)

NOTE 1 - PIPE INSULATION-4" STYROFOAM, FABRICATED PER ASTM C-450 AND C-585.

NOTE 2 - ALUMINUM JACKETING-ASTM B-209, MINIMUM 0.016" THICKNESS; 40# POLY-CRAFT PAPER MOISTURE BARRIER IN INTERIOR SIDE; SECURED WITH STAINLESS STEEL BANDING.

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

BRIDGE CROSSING PIPE HANGER DETAILS

Douglas C. Rovang
RPE-WATER UTILITY

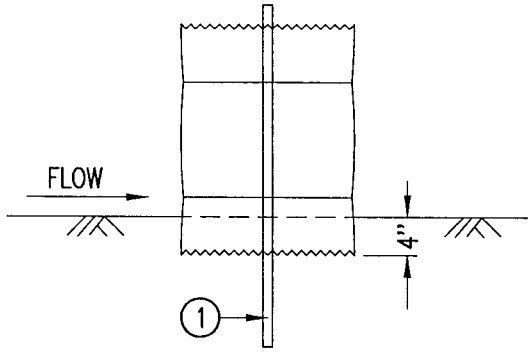
Russell W. Fries
DIRECTOR

SHT 1 OF 1 SHTS	DATE REVISED 4/1/04	PLATE NO. 6-17	REV. C

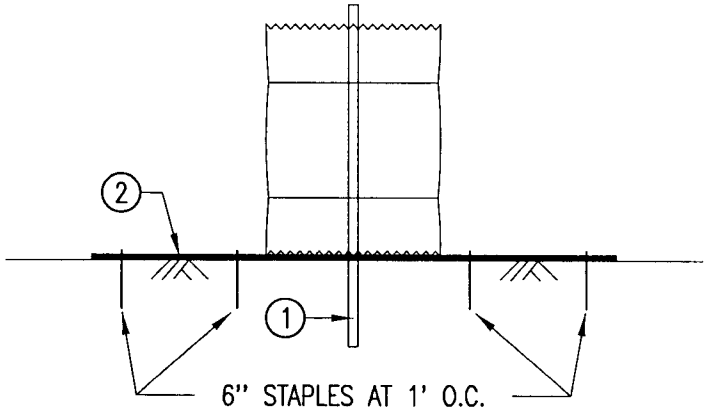
SPACING BETWEEN EACH DITCH CHECK SHOULD BE DETERMINED FROM THE SPACING FORMULA:

SPACING OF DITCH CHECK(FT)=

$$\frac{\text{HEIGHT OF DITCH CHECK(FT)} \times 100}{\text{DITCH GRADE IN PERCENT}}$$

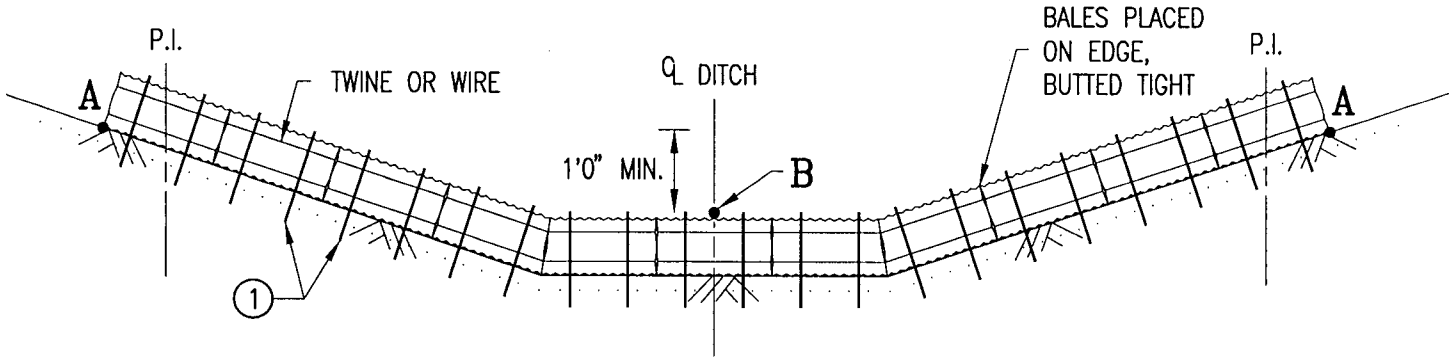


EMBEDMENT METHOD



BLANKET METHOD

BALE CHECK DETAIL



BALE DITCH CHECK

USED ON ROUGH GRADED SOIL. REMOVE AFTER ROUGH GRADING IS COMPLETED. CAN BE USED AT WETLAND PERIMETERS ANYTIME.

(1) TWO 2"x2" WOOD STAKES, METAL FENCE POSTS OR REINFORCING BARS IN EACH BALE AND EMBEDDED IN THE GROUND 10" MINIMUM.

(2) PLACE A MN/DOT SPEC. 3885 CATEGORY 3 EROSION CONTROL BLANKET, 6 FT. WIDE MINIMUM, UNDER THE BALE DITCH CHECK INSTEAD OF TRENCHING.

3. POINT "A" MUST BE 1'0" MIN. HIGHER THAN POINT "B" TO ENSURE THAT WATER FLOWS OVER THE DIKE, AND NOT AROUND THE ENDS.

4. FOR DESIGN GUIDELINES, REFER TO CHAPTER 8 OF THE MN/DOT ROAD DESIGN MANUAL.

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

DITCH CHECK-BALE

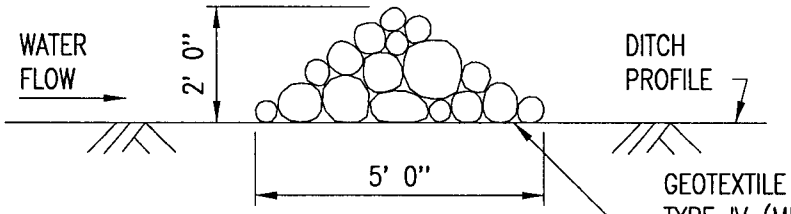
ASST. CITY ENGINEER

DIRECTOR

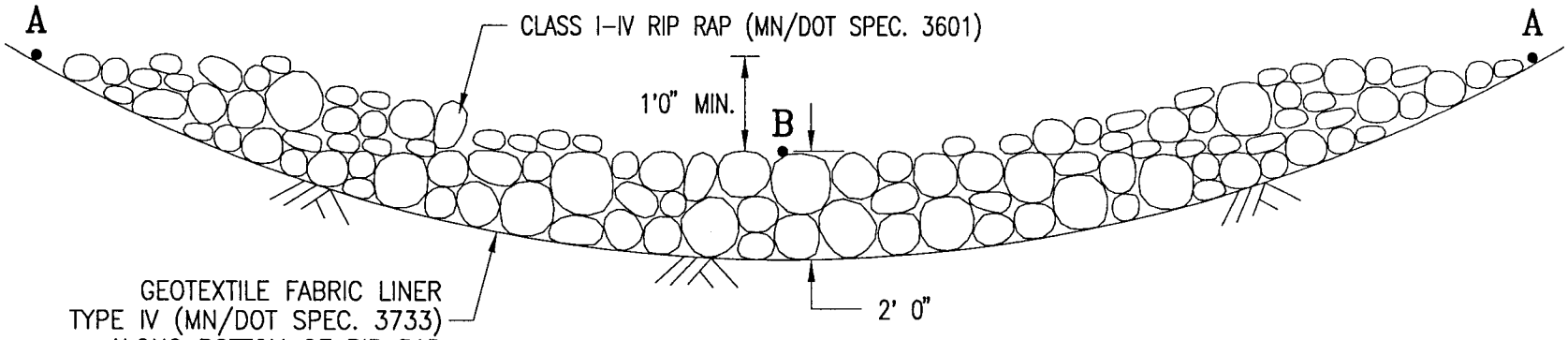
SHT 1 OF 3 SHTS	DATE REVISED 4/1/04	PLATE NO. 7-02	REV. B

SPACING BETWEEN EACH DITCH CHECK SHOULD BE DETERMINED FROM THE SPACING FORMULA:

$$\text{SPACING OF DITCH CHECK(FT)} = \frac{\text{HEIGHT OF DITCH CHECK(FT)} \times 100}{\text{DITCH GRADE IN PERCENT}}$$



ROCK CHECK DETAIL



ROCK DITCH CHECK
(MN/DOT SPEC. 3889–TYPE 7)

1. ROCK DITCH CHECK SHALL BE REMOVED FROM THE CLEAR ZONE AFTER SEEDING OR TURF IS ESTABLISHED AND PRIOR TO FINAL ACCEPTANCE.
2. POINT "A" MUST BE 1'0" MIN. HIGHER THAN POINT "B" TO ENSURE THAT WATER FLOWS OVER THE DIKE, AND NOT AROUND THE ENDS.
3. FOR DESIGN GUIDELINES, REFER TO CHAPTER 8 OF THE MN/DOT ROAD DESIGN MANUAL.

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

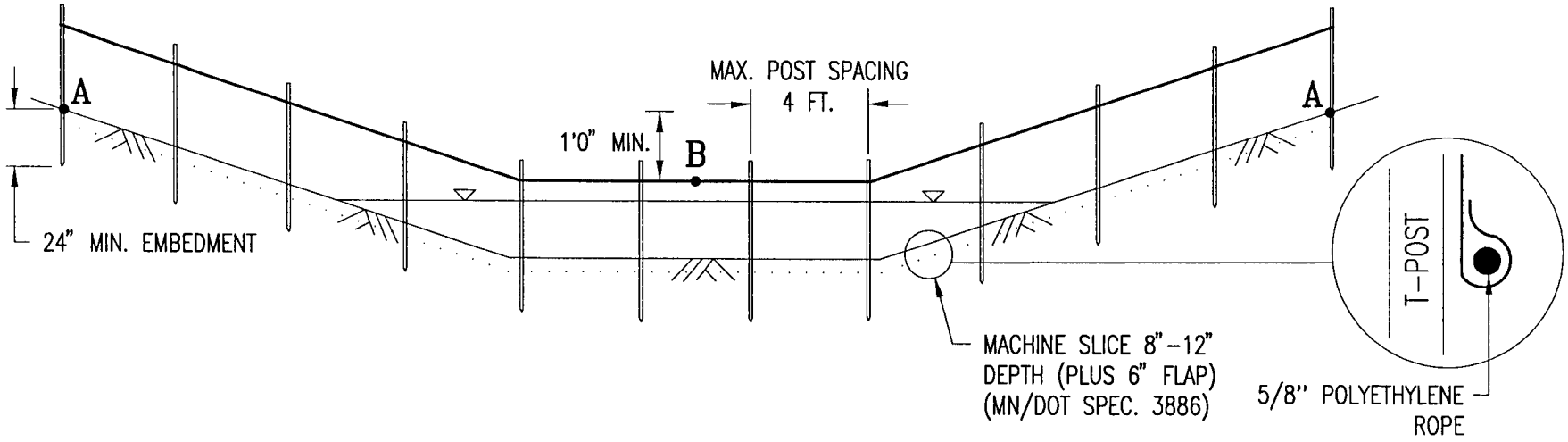
DITCH CHECK–ROCK

Douglas L. Nelson — ASST. CITY ENGINEER

Duane W. Krueger — DIRECTOR

DATE REVISED	PLATE NO.	REV.
4/1/04	7–02	C

SHT 2 OF 3 SHTS



SILT FENCE DITCH CHECK-TYPE MACHINE SLICED

(MN/DOT SPEC. 3889-TYPE 1)

SPACING BETWEEN EACH DITCH CHECK SHOULD BE DETERMINED FROM THE SPACING FORMULA:

$$\text{SPACING OF DITCH CHECK(FT)} = \frac{\text{HEIGHT OF DITCH CHECK(FT)} \times 100}{\text{DITCH GRADE IN PERCENT}}$$

NOTES:

1. POINT "A" MUST BE 1'0" MIN. HIGHER THAN POINT "B" TO ENSURE THAT WATER FLOWS OVER THE DIKE, AND NOT AROUND THE ENDS.
2. WHEN SEDIMENT BUILD UP REACHES 8" OR 1/3 OF SILT FENCE HEIGHT, THE SILT FENCE MUST BE CLEANED OUT OR REPLACED.
3. FOR DESIGN GUIDELINES, REFER TO CHAPTER 8 OF THE MN/DOT ROAD DESIGN MANUAL.

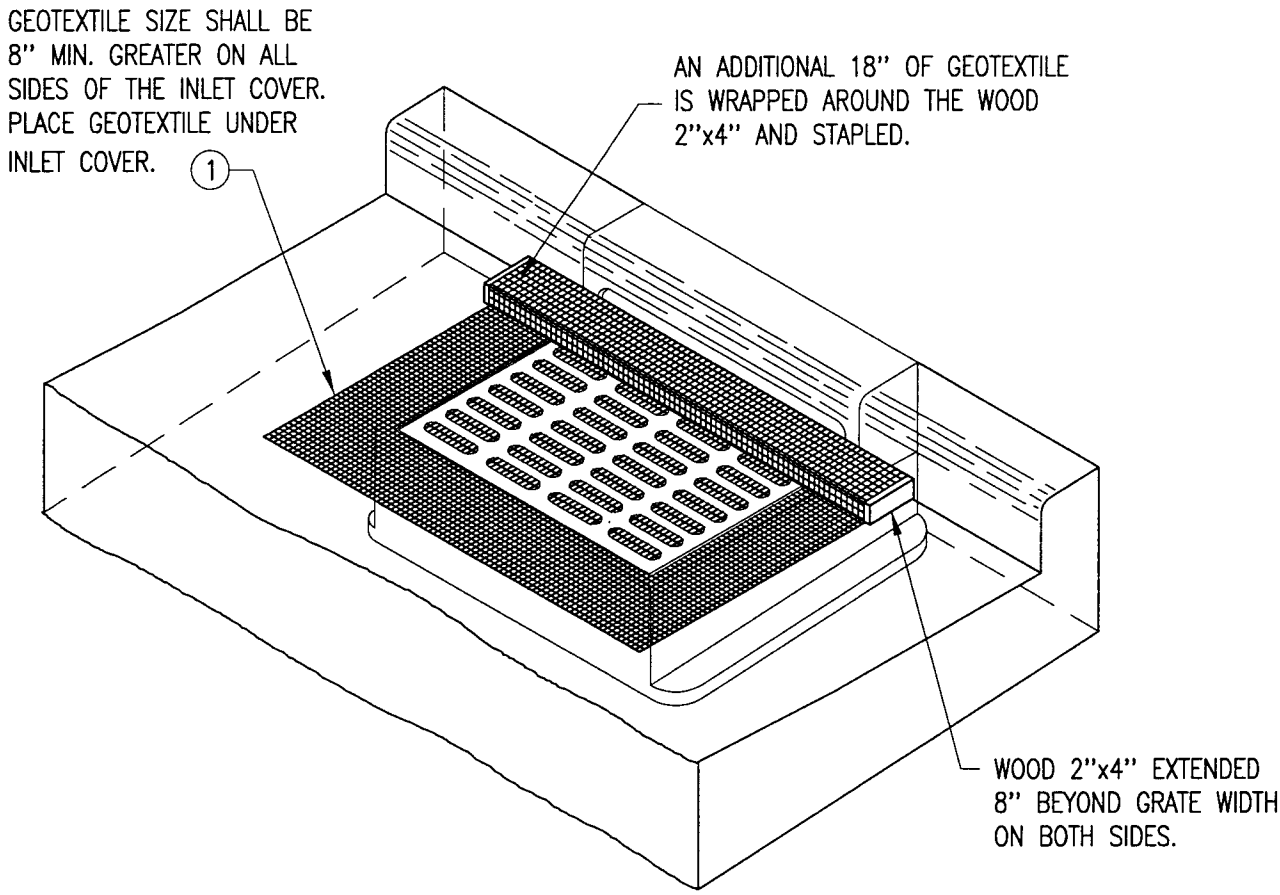
DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

DITCH CHECK-SILT FENCE

SHT	DATE REVISED	PLATE NO.	REV.
3 OF 3 SHTS	4/1/04	7-02	C

ASST. CITY ENGINEER

DIRECTOR



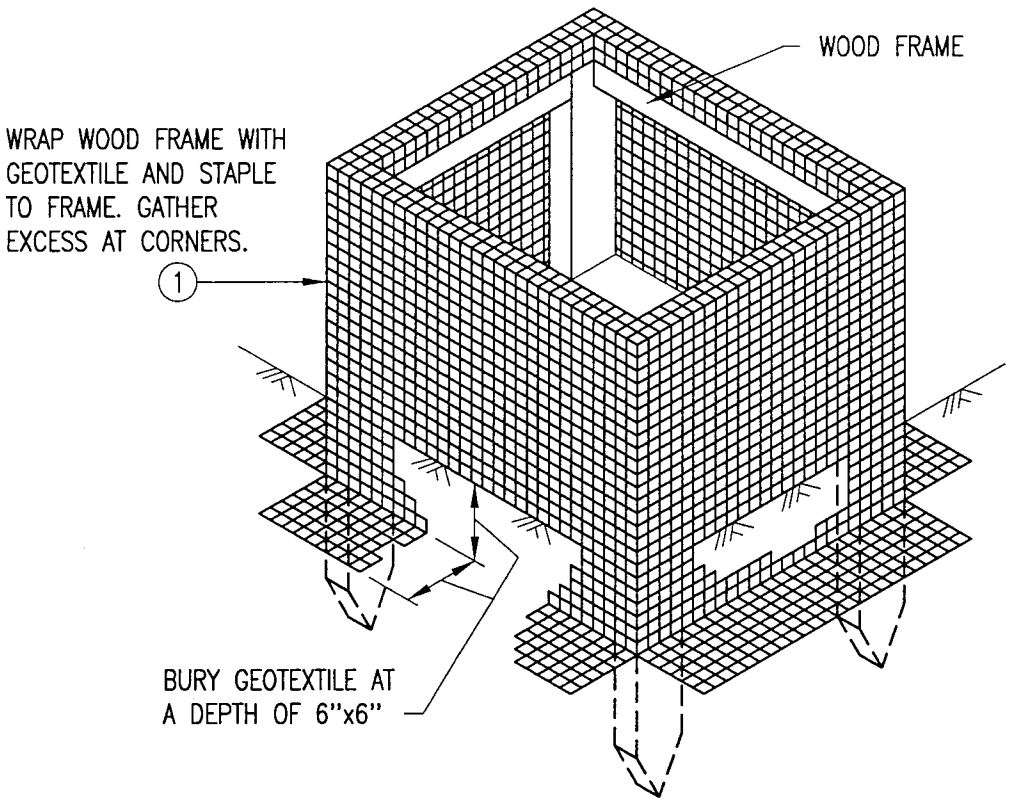
(1) ALL GEOTEXTILE USED FOR INLET PROTECTION SHALL BE MONOFILAMENT IN BOTH DIRECTIONS, MEETING MN/DOT SPEC. 3886 FOR MACHINE SLICED.

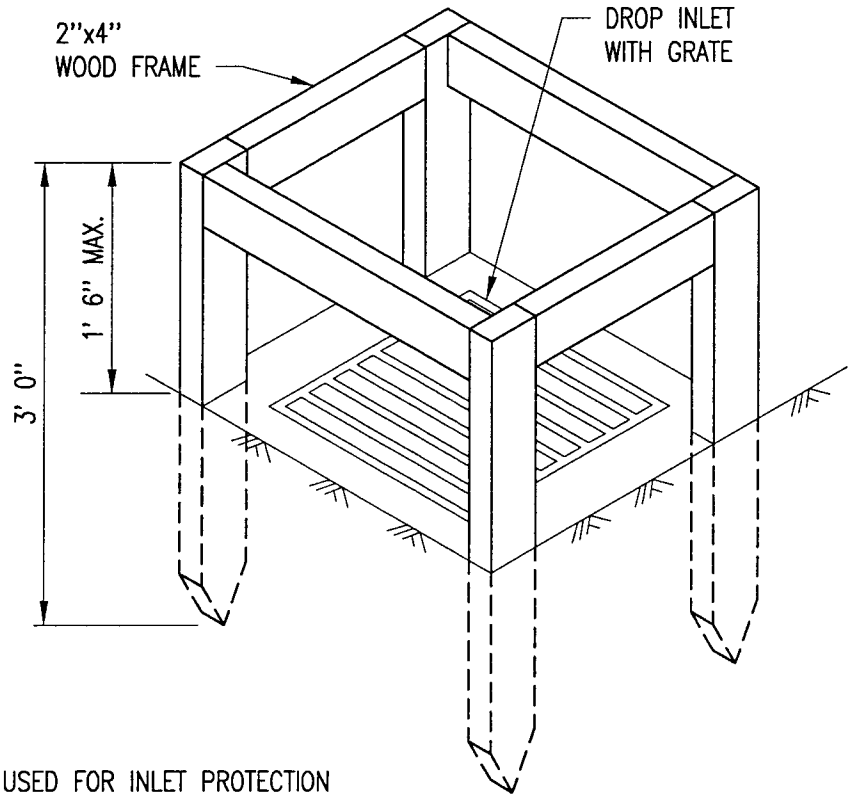
2. USE WHERE INLET DRAINS AN AREA WITH SLOPES AT 1:3 OR LESS. MN/DOT SPEC. 3891-TYPE C

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

INLET PROTECTION– GEOTEXTILE COVER INLET

ASST. CITY ENGINEER	DIRECTOR			
SHT 1 OF 3 SHTS	DATE REVISED 4/1/04	PLATE NO. 7–03	REV. B



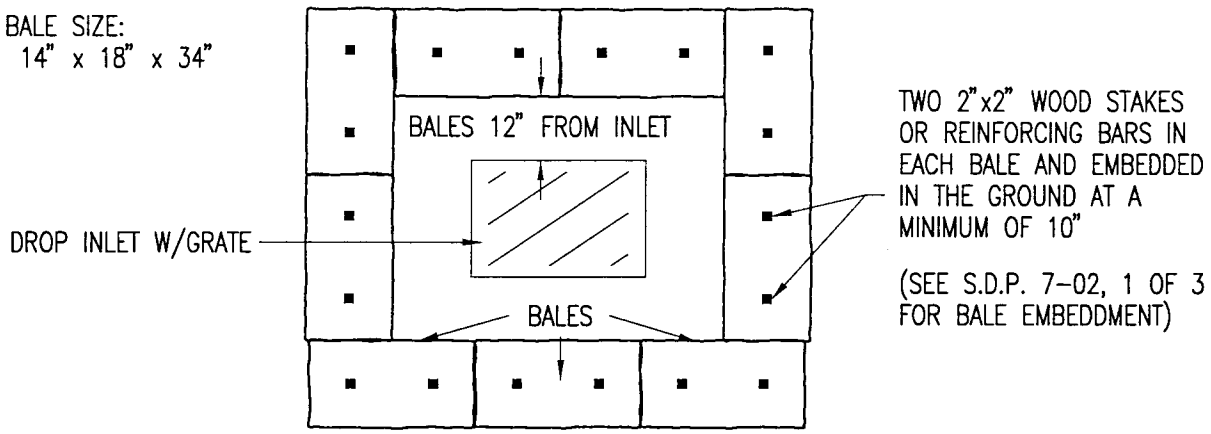


1. ALL GEOTEXTILE USED FOR INLET PROTECTION SHALL BE MONOFILAMENT IN BOTH DIRECTIONS, MEETING MN/DOT SPEC. 3886 FOR MACHINE SLICED.
2. USE WHERE INLET DRAINS AN AREA WITH SLOPES AT 1:3 OR LESS. MN/DOT SPEC. 3891-TYPE A

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

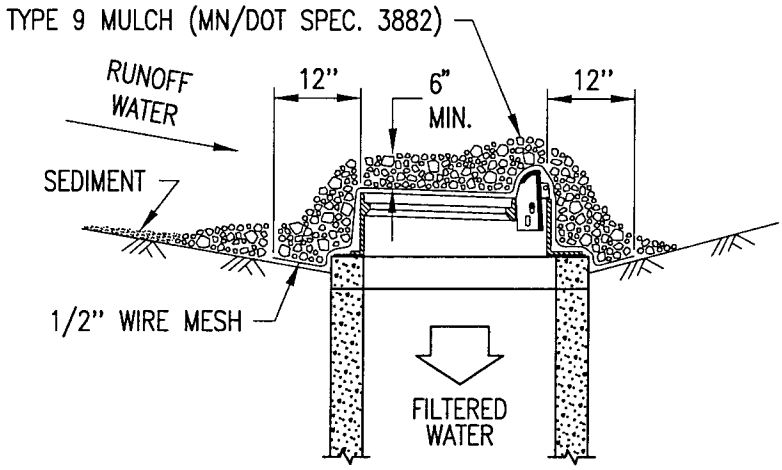
INLET PROTECTION– SILT FENCE BOX INLET

ASST. CITY ENGINEER	DIRECTOR		
SHT 2 OF 3 SHTS	DATE REVISED 4/1/04	PLATE NO. 7-03	REV. B



BALE CHECK INLET

MN/DOT SPEC. 3891-TYPE A



AGGREGATE FILTER INLET

MN/DOT SPEC. 3891-TYPE B OR C

DEPARTMENT OF PUBLIC WORKS
CITY OF ROCHESTER, MINNESOTA

**INLET PROTECTION-
BALE CHECK &
AGGREGATE FILTER INLETS**

ASST. CITY ENGINEER	DIRECTOR			
SHT 3 OF 3 SHTS	DATE REVISED 4/1/04	PLATE NO. 7-03	REV. B	